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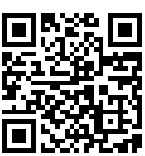

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P. A.
C.

(Alm.) 1845 e. 15/1767

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# THE

# NAUTICAL ALMANAC

## AND

# ASTRONOMICAL EPHEMERIS,

## FOR THE YEAR 1767.

Published by ORDER of the

## COMMISSIONERS OF LONGITUDE.

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LONDON:

Printed by W. RICHARDSON and S. CLARK,
PRINTERS;
AND SOLD BY
J. NOURSE, in the Strand, and Messr. MOUNT and PAGE,
on Tower-Hill,
Bookfellers to the faid COMMISSIONERS.
M DCC LXVI.

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## EXTRACT from the late Act of Parliament concerning the Longitude, made in the Fifth Year of the Reign of his preſent Majeſty.

WHEREAS the Publication of Nautical Almanacks conſtructed by proper Perſons, under the Direction of the ſaid Commiſſioners, would greatly contribute to make the ſaid Lunar Tables more generally uſeful; Be it further Enacted, by the Authority aforeſaid, That it ſhall and may be lawful to and for the ſaid Commiſſioners to cauſe ſuch Nautical Almanacks, or other uſeful Tables, to be conſtructed, and to print, publiſh, and vend, or cauſe to be printed, publiſhed, and vended, any Nautical Almanack or Almanacks, or other uſeful Table or Tables, which they, or the major Part of them, ſhall, from time to time, judge neceſſary and uſeful, in order to facilitate the Method of diſcovering the Longitude at Sea; any Law, Statute, excluſive Privilege, private Charter, or other Cuſtom, to the contrary thereof notwithſtanding.

And be it Enacted by the Authority aforeſaid, That no Perſon or Perſons ſhall print, publiſh, or vend, or cauſe to be printed, publiſhed, or vended, any Nautical Almanack or Almanacks, or other Table or Tables conſtructed under the Direction of the ſaid Commiſſioners, without being firſt licenſed by the ſaid Commiſſioners, or the major Part of them: And if any Perſon or Perſons not ſo licenſed, or not being authorized by the Perſon or Perſons ſo licenſed by the ſaid Commiſſioners, ſhall print, publiſh, or vend, or cauſe to be printed, publiſhed, or vended, any ſuch Nautical Almanack or Almanacks, or other Table or Tables, every ſuch Perſon or Perſons ſhall, for every Copy of ſuch Nautical Almanack or Table ſo printed, publiſhed, or vended, forfeit and pay the Sum of Twenty Pounds; to be recovered by Action of Debt, Bill, Plaint, or Information, in any of his Majeſty's Courts of Record at *Weſtminſter*; and that One Moiety of ſuch Penalty and Forfeiture ſhall be to his Majeſty, his Heirs and Succeſſors, and the other Moiety to him or them that ſhall proſecute, inform, or ſue for the ſame.

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By the COMMISSIONERS appointed by Acts of Parliament for the Discovery of the Longitude at Sea, and for examining, trying, and judging of all Proposals, Experiments, and Improvements relating to the same.

WHEREAS we have employed proper Persons to compute a Nautical Almanac and Astronomical Ephemeris for the Year 1767, which will greatly contribute to make the Lunar Tables constructed by the late Professor MAYER of *Goetingen* (which you have already printed with our Authority) more generally useful; and whereas we think fit to employ you to print the said Nautical Almanac and Astronomical Ephemeris: We do therefore, in pursuance of the Power vested in us by Act of Parliament, hereby license, authorize, and impower you to cause the same to be printed, together with such other useful Tables for facilitating the Method of discovering the Longitude at Sea, as shall have been constructed under our Direction, and will be delivered to you by the Reverend Mr. NEVIL MASKELYNE, his Majesty's Astronomer Royal at *Greenwich*; and for so doing this shall be your sufficient Warrant. Given under our Hands and Seals this 26th of *April* 1766.

EGMONT (L.S.)
JOHN CUST (L.S.)
HOWE (L.S.)
HEN. OSBORN (L.S.)
ED. HAWKE (L.S.)
CH. KNOWLES (L.S.)
JOHN FORBES (L.S.)
MORTON (L.S.)
N. MASKELYNE (L.S.)
T. HORNSBY (L.S.)
A. SHEPHERD (L.S.)
E. WARING (L.S.)
G. B. RODNEY (L.S.)
T. SALUSBURY (L.S.)
P. STEPHENS (L.S.)
G. COKBURNE (L.S.)
R. LONG (L.S.)

To Messr. WILLIAM RICHARDSON and SAMUEL CLARK, Printers in *Salisbury-court, Fleet-street.*

By Command of the Commissioners,
JOHN IBBETSON, Secretary.

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By the COMMISSIONERS appointed by Acts of Parliament for the Diſcovery of the Longitude at Sea, and for examining, trying, and judging of all Propoſals, Experiments, and Improvements relating to the ſame.

WHEREAS we think fit to employ you to publiſh and vend, and to cauſe to be publiſhed and vended, the Nautical Almanac and Aſtronomical Ephemeris for the Year 1767, together with other uſeful Tables (conſtructed under our Direction) for facilitating the Method of diſcovering the Longitude at Sea, which will be printed by Meſſieurs RICHARDSON and CLARK of *Saliſbury-court, Fleet-ſtreet:* We do therefore, in purſuance of the Power veſted in us by Act of Parliament, hereby licenſe, authorize, and impower you to publiſh and vend, and to cauſe to be publiſhed and vended, the ſaid Nautical Almanac and Aſtronomical Ephemeris, together with the other uſeful Tables above-mentioned. For which this ſhall be your ſufficient Warrant. Given under our Hands and Seals this 26th of *April* 1766.

EGMONT (L.S.)
JOHN CUST (L.S.)
HOWE (L.S.)
HEN. OSBORN (L.S.)
ED. HAWKE (L.S.)
CH. KNOWLES (L.S.)
JOHN FORBES (L.S.)
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A. SHEPHERD (L.S.)
E. WARING (L.S.)
G. B. RODNEY (L.S.)
T. SALUSBURY (L.S.)
PH. STEPHENS (L.S.)
G. COKBURNE (L.S.)
R. LONG (L.S.)

To Mr. JOHN NOURSE, Bookſeller in the *Strand.*

By Command of the Commiſſioners,
JOHN IBBETSON, Secretary.

☞ A Licence was alſo granted to the like Effect to Meſſ. JOHN MOUNT and THOMAS PAGE, Stationers on *Tower-hill.*

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# PREFACE.

THE Commiſſioners of Longitude, in purſuance of the Powers veſted in them by a late Act of Parliament, preſent the Publick with the NAUTICAL ALMANAC and ASTRONOMICAL EPHEMERIS for the Year 1767, to be continued annually; a Work which muſt greatly contribute to the Improvement of Aſtronomy, Geography, and Navigation. This EPHEMERIS contains every Thing eſſential to general Uſe that is to be found in any Ephemeris hitherto publiſhed, with many other uſeful and intereſting Particulars never yet offered to the Publick in any Work of this Kind. The Tables of the Moon had been brought by the late Profeſſor MAYER of Gottingen to a ſufficient Exactneſs to determine the Longitude at Sea, within a Degree, as appeared by the Trials of ſeveral Perſons who made Uſe of them. The Difficulty and Length of the neceſſary Calculations ſeemed the only Obſtacles to hinder them from becoming of general Uſe: To remove which this EPHEMERIS was made; the Mariner being hereby relieved from the Neceſſity of calculating the Moon's Place from the Tables, and afterwards computing the Diſtance to Seconds by Logarithms, which are the principal and only very delicate Part of the Calculus; ſo that the finding the Longitude by the

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the Help of the EPHEMERIS is now in a Manner reduced to the Computation of the Time, an Operation equal to that of an Azimuth, and the Correction of the Diſtance on account of Refraction and Parallax, which is alſo rendered very eaſy by either of the Two Methods invented by Mr. LYONS and Mr. DUNTHORNE, and publiſhed among the Tables requiſite to be uſed with the EPHEMERIS.

By Deſire of the Commiſſioners of Longitude I drew up the Explanation and Uſe of the Articles contained in the EPHEMERIS, and the Inſtructions, with Examples, for finding the Longitude at Sea by the Help of the ſame. I alſo collected and calculated the Sixteen Firſt Pages of Tables requiſite to be uſed with the EPHEMERIS, and computed the Table of proportional Logarithms, which ſeemed to me abſolutely neceſſary to clear this Method of any remaining Difficulty; and added Explanations of all the Tables, and a Correction, p. 49 and 50, which may be applied by the Curious to the Effect of Refraction on the Moon's Diſtance from a Star, found by Mr. LYONS, or any other Method, on account of the Barometer and Thermometer.

All the Calculations of the EPHEMERIS relating to the Sun and Moon were made from Mr. MAYER's laſt manuſcript Tables, received by the Board of Longitude after his Deceaſe, which have been printed under my Inſpection, and will be publiſhed ſhortly. The Calculations of the Planets were made from Dr. HALLEY's Tables; and thoſe of the Eclipſes of Jupiter's Satellites from the Tables of Mr. WARGENTIN, publiſhed by M. DE LA LANDE in 1759, except thoſe of the Fourth Satellite,

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lite, which were calculated from the Tables of the ſame further improved by Mr. WARGENTIN, and publiſhed alſo by M. DE LA LANDE in the CONNOISSANCE DES MOUVEMENTS CELESTES of 1766.

All the Articles of the EPHEMERIS were computed by Two ſeparate Perſons, and examined by a Third, except the Moon's Longitude, Latitude, Right Aſcenſion, Declination, Semidiameter, and Parallax, which, for Noon, were computed by One Perſon, and for Midnight by another, and the Truth of theſe Calculations aſcertained by means of Differences, which, for the Moon's Longitude, were carried as far as the Fourth Order.

NEVIL MASKELYNE,
ASTRONOMER ROYAL.

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## EXPLANATION of the Characters uſed in the EPHEMERIS.

### The PLANETS, &c.

☉ The Sun.
☾ The Moon.
☿ Mercury.
♀ Venus.
♂ Mars.
♃ Jupiter.
♄ Saturn.
☊ The Moon's, or any other Planet's Aſcending Node.
☋ The Deſcending Node.
☌ Conjunction, or Planets ſituated in the ſame Longitude.
☍ Oppoſition, or Planets ſituated in oppoſite Longitudes, or differing 6 Signs from each other.

### Signs of the Zodiac.

♈ Aries.
♉ Taurus.
♊ Gemini.
♋ Cancer.
♌ Leo.
♍ Virgo.
♎ Libra.
♏ Scorpio.
♐ Sagittarius.
♑ Capricornus.
♒ Aquarius.
♓ Piſces.

## ECLIPSES of the YEAR 1767.

Jan. 29. ☉ eclipſed, inviſible in Europe. ☌ at 15ʰ. 43′. in 10ˢ. 10°. 8′. with 1′. North Latitude.

July 25. ☉ eclipſed, begins at Sun-riſing in Lat. S. 19°. 16′. Long. 141°. 45′. W. Ends at Sun-ſetting in Lat. 3°. 23′. S. Long. 60°. 5′. Weſt. Centrally eclipſed on the Merid. in Lat. 1°. 15′. South.

| | Obliquity of Ecliptic. ° ′ ″ | Equat. of Equinoct. Points. ″ |
|---|---|---|
| Jan. 1. | 23. 28. 17,2 | +13,5 |
| Apr. 1. | 23. 28. 16,7 | +14,5 |
| July 1. | 23. 28. 16,0 | +15,3 |
| Oct. 1. | 23. 28. 15,2 | +16,0 |
| Dec. 31. | 23. 28. 14,4 | +16,6 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | Th. | Circumcision. |
| 2 | F. | |
| 3 | Sa. | |
| 4 | *Su.* | *2d. Sun. after Christmas.* |
| 5 | M. | |
| 6 | Tu. | Epiphany. |
| 7 | W. | |
| 8 | Th. | Lucian. |
| 9 | F. | |
| 10 | Sa. | |
| 11 | *Su.* | *1st. Sun. after Epiphany.* |
| 12 | M. | |
| 13 | Tu | Hil. Cam. Term begins. |
| 14 | W. | Oxford Term begins. |
| 15 | Th. | |
| 16 | F. | |
| 17 | Sa. | [Q.'s Birth-day kept. |
| 18 | *Su.* | *2d. Sun. after Epiphany.* |
| 19 | M. | [Hilary, 1 ret. |
| 20 | Tu. | Fabian. In 8 days of St. |
| 21 | W. | Agnes. |
| 22 | Th. | Vincent. |
| 23 | F. | Hilary Term begins. |
| 24 | Sa. | [*verf. of St. Paul.* |
| 25 | *Su.* | *3d. Su. after Epiph. Con-* |
| 26 | M. | |
| 27 | Tu. | From St. Hilary in 15 |
| 28 | W. | [days, 2 ret. |
| 29 | Th. | |
| 30 | F. | K. Charles I. Martyr. |
| 31 | Sa. | |

Phases of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| First Quarter — | 6. | 20. | 23 |
| Full Moon —— | 14. | 12. | 40 |
| Last Quarter—— | 22. | 17. | 39 |
| New Moon—— | 29. | 15. | 43 |

Other Phenomena.

D.

1. ☿ μ ♐ diff. Lat. 50′.
3. ☾ θ ♒ 13h. 12′.
5. ☾ λ ♓ 3h. 55′.
7. ♃ Station. approaches to β ♏, but does not come to ☌ with it.
9. ☾ ν Pleiadum 20h.22′.
10. ☾ χ ♉ 11h. 33′.
11. ☾ β ♉ 15h. 7′.
13. ☾ ε ♊ 0h. 46′.
14. ♄ ι ♉ diff. Lat. 18′.
15. ☾ ☌ ♋ 10h. 12′.
16. ☌ ε ♓ diff. Lat. 50′.
19. ☾ υ ♌ 8h. 11′.
⊙ ente[illegible] at 16h. 30′.
☌ ζ ♓ diff. Lat. 30′.
24. ☾ ☍ ♏, 18h. 43′.
25. ☾ σ ♏, 3h. 22′.
☾ α ♏, 6h 48′.
27. ☾ λ ♐ 4h. 1′.
☾ φ ♐ 10h. 22′.
☾ σ ♐ 14h. 0′.
29. ⊙ eclipsed invisible in Europe.
☌ 15h. 43′. in 10s. 10°. 8′.
☾ Lat. 1′ North.



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# JANUARY 1767.

| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declin. South. | Equat. of Time Add. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | Th. | 9. 10. 57. 44 | 18. 47. 42 | 23. 1. 6 | 4. 7 | 28 |
| 2 | F. | 9. 11. 58. 56 | 18. 52. 7 | 22. 55. 50 | 4. 35 | 28 |
| 3 | Sa. | 9. 13. 0. 8 | 18. 56. 31 | 22. 50. 6 | 5. 3 | 27 |
| 4 | Su. | 9. 14. 1. 20 | 19. 0. 55 | 22. 43. 56 | 5. 30 | 27 |
| 5 | M. | 9. 15. 2. 32 | 19. 5. 19 | 22. 37. 18 | 5. 57 | 26 |
| 6 | Tu. | 9. 16. 3. 43 | 19. 9. 42 | 22. 30. 13 | 6. 23 | 27 |
| 7 | W. | 9. 17. 4. 53 | 19. 14. 5 | 22. 22. 42 | 6. 50 | 25 |
| 8 | Th. | 9. 18. 6. 2 | 19. 18. 27 | 22. 14. 45 | 7. 15 | 26 |
| 9 | F. | 9. 19. 7. 11 | 19. 22. 49 | 22. 6. 21 | 7. 41 | 24 |
| 10 | Sa. | 9. 20. 8. 20 | 19. 27. 10 | 21. 57. 32 | 8. 5 | 24 |
| 11 | Su. | 9. 21. 9. 26 | 19. 31. 30 | 21. 48. 17 | 8. 29 | 24 |
| 12 | M. | 9. 22. 10. 34 | 19. 35. 50 | 21. 38. 36 | 8. 53 | 22 |
| 13 | Tu. | 9. 23. 11. 40 | 19. 40. 9 | 21. 28. 31 | 9. 15 | 22 |
| 14 | W. | 9. 24. 12. 45 | 19. 44. 27 | 21. 18. 1 | 9. 37 | 21 |
| 15 | Th. | 9. 25. 13. 49 | 19. 48. 46 | 21. 7. 6 | 9. 58 | 21 |
| 16 | F. | 9. 26. 14. 54 | 19. 53. 3 | 20. 55. 47 | 10. 19 | 20 |
| 17 | Sa. | 9. 27. 15. 57 | 19. 57. 19 | 20. 44. 4 | 10. 39 | 19 |
| 18 | Su. | 9. 28. 17. 0 | 20. 1. 35 | 20. 31. 58 | 10. 58 | 18 |
| 19 | M. | 9. 29. 18. 2 | 20. 5. 50 | 20. 19. 28 | 11. 16 | 18 |
| 20 | Tu. | 10. 0. 19. 4 | 20. 10. 4 | 20. 6. 35 | 11. 34 | 17 |
| 21 | W. | 10. 1. 20. 5 | 20. 14. 18 | 19. 53. 20 | 11. 51 | 16 |
| 22 | Th. | 10. 2. 21. 6 | 20. 18. 30 | 19. 39. 43 | 12. 7 | 16 |
| 23 | F. | 10. 3. 22. 6 | 20. 22. 43 | 19. 25. 43 | 12. 23 | 15 |
| 24 | Sa. | 10. 4. 23. 6 | 20. 26. 54 | 19. 11. 22 | 12. 38 | 14 |
| 25 | Su. | 10. 5. 24. 5 | 20. 31. 5 | 18. 56. 40 | 12. 52 | 13 |
| 26 | M. | 10. 6. 25. 4 | 20. 35. 14 | 18. 41. 37 | 13. 5 | 12 |
| 27 | Tu. | 10. 7. 26. 2 | 20. 39. 23 | 18. 26. 14 | 13. 17 | 12 |
| 28 | W. | 10. 8. 26. 58 | 20. 43. 31 | 18. 10. 31 | 13. 29 | 10 |
| 29 | Th. | 10. 9. 27. 54 | 20. 47. 39 | 17. 54. 28 | 13. 39 | 10 |
| 30 | F. | 10. 10. 28. 49 | 20. 51. 45 | 17. 38. 6 | 13. 49 | 9 |
| 31 | Sa. | 10. 11. 29. 43 | 20. 55. 51 | 17. 21. 25 | 13. 58 | 8 |

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| Days. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | ☊ ° ′ |
| 1 | 16. 19, 2 | 1. 10, 8 | 2. 32, 9 | 9, 992665 | 10. 11. 28 |
| 7 | 16. 19, 1 | 1. 10, 6 | 2. 32, 8 | 9, 992717 | 10. 11. 9 |
| 13 | 16. 18, 8 | 1. 10, 2 | 2. 32, 7 | 9, 992847 | 10. 10. 50 |
| 19 | 16. 18, 2 | 1. 9, 6 | 2. 32, 6 | 9, 993078 | 10. 10. 31 |
| 25 | 16. 17, 5 | 1. 9. 0 | 2. 32. 3 | 9, 993401 | 10. 10. 12 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Immersions. | | II. Satellite. Immersions. | | III. Satellite. | |
|---|---|---|---|---|---|
| D. | h ′ ″ | D. | h ′ ″ | D. | h ′ ″ |
| 1 | 20. 56. 15 | 1 | 0. 8. 34 | 4 | 15*22. 47 I. |
| 3 | 15*23. 50 | 4 | 13*23. 22 | 4 | 18*40. 20 E. |
| 5 | 9. 51. 27 | 8 | 2. 38. 13 | 11 | 19. 17. 36 I. |
| 7 | 4. 19. 4 | 11 | 15*53. 13 | 11 | 22. 34. 21 E. |
| 8 | 22. 46. 44 | 15 | 5. 8. 23 | 18 | 23. 12. 56 I. |
| 10 | 17*14. 22 | 18 | 18*23. 39 | 19 | 2. 28. 57 E. |
| 12 | 11*42. 8 | 22 | 7. 39. 9 | 26 | 3. 8. 53 I. |
| 14 | 6. 9. 50 | 25 | 20. 54. 50 | 26 | 6. 24. 11 E. |
| 16 | 0. 37. 38 | 29 | 10*10. 41 | | |
| 17 | 19* 5. 29 | | | IV. Satellite. | |
| 19 | 13*33. 22 | | | | |
| 21 | 8. 1. 17 | | | D. | H. ′ ″ |
| 23 | 2. 29. 13 | | | 8 | 17*15. 59 I. |
| 24 | 20. 57. 12 | | | 8 | 21. 14. 19 E. |
| 26 | 15*25. 15 | | | 25 | 11* 7. 4 I. |
| 28 | 9*53. 19 | | | 25 | 15* 0. 48 E. |
| 30 | 4. 21. 28 | | | | |
| 31 | 22. 49. 39 | | | | |



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| Days | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| **MERCURY. greatest Elong. 19d.** | | | | | | |
| 1 | 4. 2. 53 | 6. 49 N | 9. 0. 54 | 3. 12 N | 20. 16 S | 23. 10 |
| 7 | 5. 3. 58 | 6. 38 | 8. 27. 39 | 3. 2 | 20. 25 | 22. 32 |
| 13 | 5. 29. 42 | 5. 2 | 8. 29. 46 | 2. 11 | 21. 17 | 22. 18 |
| 19 | 6. 21. 14 | 2. 54 | 9. 4. 57 | 1. 12 | 22. 10 | 22. 15 |
| 25 | 7. 10. 4 | 0. 41 | 9. 11. 59 | 0. 17 | 22. 40 | 22. 22 |
| **VENUS. sup. ☌ 9d. 12h.** | | | | | | |
| 1 | 9. 6. 11 | 1. 15 S | 9. 8. 55 | 0. 32 S | 23. 42 S | 23. 52 |
| 7 | 9. 15. 40 | 1. 45 | 9. 16. 28 | 0. 45 | 23. 12 | 23. 59 |
| 13 | 9. 25. 9 | 2. 12 | 9. 24. 1 | 0. 56 | 22. 15 | 0. 4 |
| 19 | 10. 4. 38 | 2. 36 | 10. 1. 34 | 1. 6 | 20. 55 | 0. 10 |
| 25 | 10. 14. 8 | 2. 55 | 10. 9. 7 | 1. 15 | 19. 12 | 0. 16 |
| **MARS.** | | | | | | |
| 1 | 1. 16. 32 | 0. 3 S | 0. 5. 6 | 0. 4 S | 1. 56 N | 5. 29 |
| 7 | 1. 19. 52 | 0. 3 N | 0. 8. 49 | 0. 4 N | 3. 34 | 5. 17 |
| 13 | 1. 23. 9 | 0. 10 | 0. 12. 40 | 0. 11 | 5. 11 | 5. 5 |
| 19 | 1. 26. 25 | 0. 16 | 0. 16. 33 | 0. 18 | 6. 47 | 4. 54 |
| 25 | 1. 29. 38 | 0. 22 | 0. 20. 26 | 0. 23 | 8. 21 | 4. 43 |
| **JUPITER.** | | | | | | |
| 1 | 5. 15. 1 | 1. 11 N | 5. 22. 57 | 1. 16 N | 3. 59 N | 16. 45 |
| 7 | 5. 15. 28 | 1. 12 | 5. 23. 1 | 1. 19 | 3. 59 | 16. 19 |
| 13 | 5. 13. 56 | 1. 12 | 5. 22. 57 | 1. 20 | 4. 2 | 15. 53 |
| 19 | 5. 14. 23 | 1. 12 | 5. 22. 47 | 1. 22 | 4. 8 | 15. 26 |
| 25 | 5. 14. 51 | 1. 13 | 5. 22. 30 | 1. 24 | 4. 16 | 15. 1 |
| **SATURN.** | | | | | | |
| 1 | 2. 17. 9 | 1. 25 S | 2. 14. 11 | 1. 34 S | 20. 58 N | 10. 3 |
| 7 | 2. 17. 13 | 1. 24 | 2. 13. 47 | 1. 33 | 20. 57 | 9. 38 |
| 13 | 2. 17. 27 | 1. 24 | 2. 13. 27 | 1. 32 | 20. 55 | 9. 11 |
| 19 | 2. 17. 40 | 1. 23 | 2. 13. 9 | 1. 31 | 20. 55 | 8. 43 |
| 25 | 2. 17. 54 | 1. 23 | 2. 12. 55 | 1. 29 | 20. 54 | 8. 17 |

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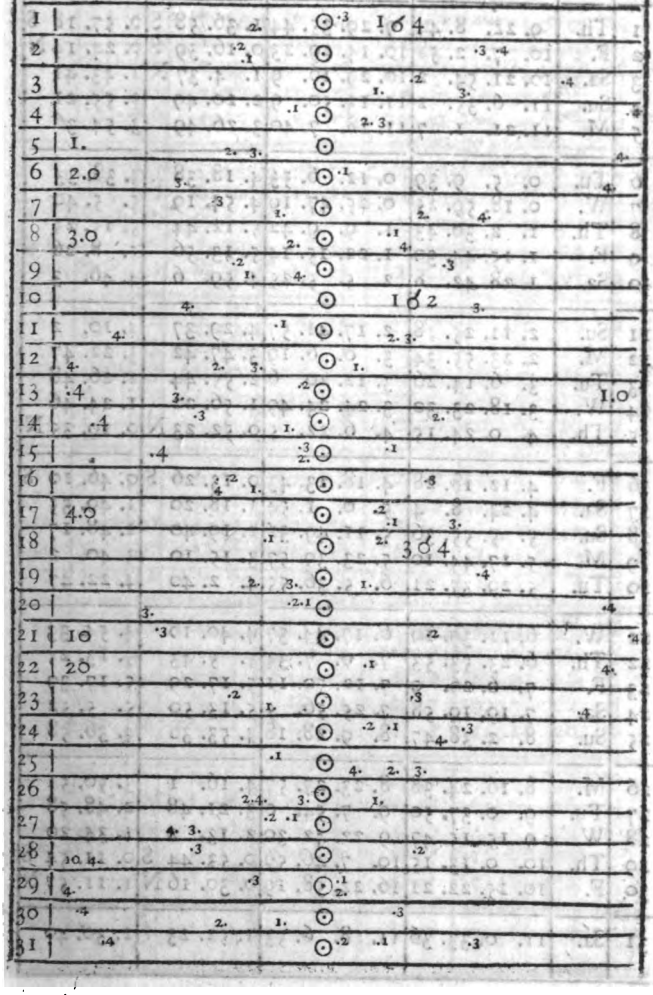
## Configurations of the SATELLITES of JUPITER at 11 o'th' Clock in the Evening.



| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | h ° ′ ″ | s ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Th. | 9. 22. 8. 44 | 9. 29. 35. 44 | 1. 36. 58 S | 0. 57. 18 S |
| 2 | F. | 10. 7. 2. 58 | 10. 14. 29. 23 | 0. 16. 39 S | 0. 24. 14 N |
| 3 | Sa. | 10. 21. 54. 2 | 10. 29. 16. 9 | 1. 4. 37 N | 1. 43. 41 |
| 4 | Su. | 11. 6. 35. 2 | 11. 13. 50. 9 | 2. 20. 49 | 2. 55. 21 |
| 5 | M. | 11. 21. 1. 7 | 11. 28. 7. 40 | 3. 26. 49 | 3. 54. 36 |
| 6 | Tu. | 0. 5. 9. 39 | 0. 12. 6. 53 | 4. 18. 38 | 4. 38. 33 |
| 7 | W. | 0. 18. 59. 25 | 0. 25. 47. 19 | 4. 54. 19 | 5. 5. 40 |
| 8 | Th. | 1. 2. 30. 43 | 1. 9. 9. 42 | 5. 12. 44 | 5. 15. 25 |
| 9 | F. | 1. 15. 44. 30 | 1. 22. 15. 14 | 5. 13. 56 | 5. 8. 26 |
| 10 | Sa. | 1. 28. 42. 8 | 2. 5. 5. 25 | 4. 59. 6 | 4. 46. 3 |
| 11 | Su. | 2. 11. 25. 18 | 2. 17. 41. 57 | 4. 29. 37 | 4. 10. 2 |
| 12 | M. | 2. 23. 55. 34 | 3. 0. 6. 19 | 3. 47. 42 | 3. 22. 47 |
| 13 | Tu. | 3. 6. 14. 26 | 3. 12. 20. 6 | 2. 55. 44 | 2. 26. 48 |
| 14 | W. | 3. 18. 23. 30 | 3. 24. 24. 49 | 1. 56. 22 | 1. 24. 46 |
| 15 | Th. | 4. 0. 24. 15 | 4. 6. 22. 5 | 0. 52. 23 N | 0. 19. 35 N |
| 16 | F. | 4. 12. 18. 28 | 4. 18. 13. 43 | 0. 13. 26 S | 0. 46. 10 S |
| 17 | Sa. | 4. 24. 8. 4 | 5. 0. 1. 54 | 1. 18. 20 | 1. 49. 35 |
| 18 | Su. | 5. 5. 55. 36 | 5. 11. 49. 32 | 2. 19. 40 | 2. 48. 17 |
| 19 | M. | 5. 17. 44. 10 | 5. 23. 39. 57 | 3. 15. 10 | 3. 40. 2 |
| 20 | Tu. | 5. 29. 37. 21 | 6. 5. 36. 55 | 4. 2. 40 | 4. 22. 47 |
| 21 | W. | 6. 11. 39. 10 | 6. 17. 44. 37 | 4. 40. 10 | 4. 54. 33 |
| 22 | Th. | 6. 23. 53. 53 | 7. 0. 7. 34 | 5. 5. 43 | 5. 13. 25 |
| 23 | F. | 7. 6. 26. 9 | 7. 12. 50. 11 | 5. 17. 29 | 5. 17. 39 |
| 24 | Sa. | 7. 19. 19. 58 | 7. 25. 56. 5 | 5. 13. 50 | 5. 5. 52 |
| 25 | Su. | 8. 2. 38. 47 | 8. 9. 28. 18 | 4. 53. 38 | 4. 36. 58 |
| 26 | M. | 8. 16. 24. 38 | 8. 23. 27. 57 | 4. 16. 1 | 3. 50. 51 |
| 27 | Tu. | 9. 0. 37. 50 | 9. 7. 54. 0 | 3. 21. 48 | 2. 48. 58 |
| 28 | W. | 9. 15. 15. 47 | 9. 22. 42. 30 | 2. 13. 2 | 1. 34. 20 |
| 29 | Th. | 10. 0. 13. 15 | 10. 7. 46. 56 | 0. 53. 44 S | 0. 11. 54 S |
| 30 | F. | 10. 15. 22. 21 | 10. 22. 58. 19 | 0. 30. 16 N | 1. 11. 57 N |
| 31 | Sa. | 11. 0. 33. 36 | 11. 8. 6. 53 | 1. 52. 23 | 2. 30. 40 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Paſſage over Merid. | ☽'s Right Aſcen. at Noon. | ☽ Right Aſc. at Midn. | ☽'s Declinat. at Noon. | ☽'s Declin. at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h / | ° / | ° / | ° / | ° / |
| 1 | Th. | 2 | 0. 51 | 294. 12 | 301. 59 | 23. 14 S | 21. 10 S |
| 2 | F. | 3 | 1. 50 | 309. 33 | 316. 50 | 18. 48 | 16. 6 |
| 3 | Sa. | 4 | 2. 45 | 323. 55 | 330. 48 | 13. 13 | 10. 8 |
| 4 | Su. | 5 | 3. 36 | 337. 29 | 343. 59 | 6. 57 | 3. 40 S |
| 5 | M. | 6 | 4. 25 | 350. 25 | 356. 44 | 0. 24 S | 2. 52 N |
| 6 | Tu. | 7 | 5. 12 | 3. 1 | 9. 18 | 6. 0 N | 9. 4 |
| 7 | W. | 8 | 6. 0 | 15. 38 | 22. 0 | 11. 58 | 14. 42 |
| 8 | Th. | 9 | 6. 49 | 28. 25 | 34. 59 | 17. 14 | 19. 30 |
| 9 | F. | 10 | 7. 39 | 41. 38 | 48. 24 | 21. 32 | 23. 22 |
| 10 | Sa. | 11 | 8. 32 | 55. 15 | 62. 12 | 24. 44 | 25. 54 |
| 11 | Su. | 12 | 9. 25 | 69. 12 | 76. 13 | 26. 38 | 27. 0 |
| 12 | M. | 13 | 10. 18 | 83. 11 | 90. 7 | 27. 7 | 26. 51 |
| 13 | Tu. | 14 | 11. 10 | 96. 59 | 103. 40 | 26. 15 | 25. 20 |
| 14 | W. | 15 | 11. 59 | 110. 13 | 116. 37 | 24. 7 | 22. 39 |
| 15 | Th. | 16 | 12. 45 | 122. 48 | 128. 50 | 20. 56 | 19. 3 |
| 16 | F. | 17 | 13. 28 | 134. 42 | 140. 26 | 16. 55 | 14. 39 |
| 17 | Sa. | 18 | 14. 11 | 146. 0 | 151. 29 | 12. 16 | 9. 46 |
| 18 | Su. | 19 | 14. 49 | 156. 51 | 162. 10 | 7. 12 | 4. 32 N |
| 19 | M. | 20 | 15. 28 | 167. 27 | 172. 44 | 1. 51 N | 0. 52 S |
| 20 | Tu. | 21 | 16. 8 | 178. 3 | 183. 25 | 3. 33 S | 6. 15 |
| 21 | W. | 22 | 16. 49 | 188. 53 | 194. 27 | 8. 54 | 11. 30 |
| 22 | Th. | 23 | 17. 34 | 200. 11 | 206. 7 | 14. 0 | 16. 25 |
| 23 | F. | 24 | 18. 22 | 212. 16 | 218. 40 | 18. 40 | 20. 45 |
| 24 | Sa. | 25 | 19. 14 | 225. 20 | 232. 17 | 22. 37 | 24. 12 |
| 25 | Su. | 26 | 20. 14 | 239. 30 | 247. 1 | 25. 31 | 26. 27 |
| 26 | M. | 27 | 21. 16 | 254. 44 | 262. 40 | 27. 1 | 27. 8 |
| 27 | Tu. | 28 | 22. 18 | 270. 43 | 278. 48 | 26. 50 | 26. 1 |
| 28 | W. | 29 | 23. 20 | 286. 51 | 294. 49 | 24. 48 | 23. 5 |
| 29 | Th. | 1 | ♂ | 302. 38 | 310. 15 | 21. 0 | 18. 33 |
| 30 | F. | 2 | 0. 18 | 317. 41 | 324. 55 | 15. 46 | 12. 46 |
| 31 | Sa. | 3 | 1. 13 | 331. 58 | 338. 49 | 9. 32 | 6. 11 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Th. | 16. 34 | 16. 35 | 60. 47 | 60. 51 | 9944 | 9939 |
| 2 | F. | 16. 35 | 16. 34 | 60. 52 | 60. 49 | 9938 | 9941 |
| 3 | Sa. | 16. 32 | 16. 30 | 60. 42 | 60. 32 | 9950 | 9962 |
| 4 | Su. | 16. 26 | 16. 21 | 60. 18 | 60. 1 | 9979 | 9999 |
| 5 | M. | 16. 16 | 16. 11 | 59. 43 | 59. 25 | 0021 | 0042 |
| 6 | Tu. | 16. 6 | 16. 0 | 59. 5 | 58. 44 | 0067 | 0093 |
| 7 | W. | 15. 54 | 15. 48 | 58. 22 | 58. 1 | 0120 | 0146 |
| 8 | Th. | 15. 43 | 15. 37 | 57. 40 | 57. 20 | 0172 | 0197 |
| 9 | F. | 15. 32 | 15. 27 | 57. 1 | 56. 43 | 0221 | 0244 |
| 10 | Sa. | 15. 22 | 15. 18 | 56. 25 | 56. 9 | 0267 | 0288 |
| 11 | Su. | 15. 14 | 15. 9 | 55. 53 | 55. 38 | 0309 | 0328 |
| 12 | M. | 15. 6 | 15. 2 | 55. 24 | 55. 12 | 0346 | 0362 |
| 13 | Tu. | 15. 0 | 14. 57 | 55. 2 | 54. 51 | 0375 | 0390 |
| 14 | W. | 14. 54 | 14. 52 | 54. 41 | 54. 32 | 0403 | 0415 |
| 15 | Th. | 14. 50 | 14. 48 | 54. 25 | 54. 19 | 0424 | 0432 |
| 16 | F. | 14. 47 | 14. 46 | 54. 14 | 54. 10 | 0439 | 0444 |
| 17 | Sa. | 14. 45 | 14. 45 | 54. 8 | 54. 8 | 0447 | 0447 |
| 18 | Su. | 14. 45 | 14. 46 | 54. 9 | 54. 12 | 0446 | 0442 |
| 19 | M. | 14. 47 | 14. 49 | 54. 16 | 54. 22 | 0436 | 0428 |
| 20 | Tu. | 14. 51 | 14. 55 | 54. 31 | 54. 43 | 0416 | 0400 |
| 21 | W. | 14. 59 | 15. 3 | 54. 58 | 55. 14 | 0381 | 0359 |
| 22 | Th. | 15. 8 | 15. 13 | 55. 32 | 55. 52 | 0336 | 0310 |
| 23 | F. | 15. 19 | 15. 26 | 56. 14 | 56. 39 | 0282 | 0250 |
| 24 | Sa. | 15. 33 | 15. 41 | 57. 6 | 57. 35 | 0215 | 0179 |
| 25 | Su. | 15. 49 | 15. 57 | 58. 3 | 58. 33 | 0143 | 0106 |
| 26 | M. | 16. 4 | 16. 12 | 59. 2 | 59. 29 | 0071 | 0038 |
| 27 | Tu. | 16. 19 | 16. 26 | 59. 54 | 60. 18 | 0007 | 9979 |
| 28 | W. | 16. 32 | 16. 37 | 60. 40 | 60. 58 | 9952 | 9931 |
| 29 | Th. | 16. 41 | 16. 43 | 61. 12 | 61. 21 | 9914 | 9903 |
| 30 | F. | 16. 44 | 16. 44 | 61. 26 | 61. 25 | 9898 | 9899 |
| 31 | Sa. | 16. 43 | 16. 40 | 61. 20 | 61. 11 | 9905 | 9915 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | | | | |
| 2 | α Pegasi. | 46. 41. 15 | 44. 57. 51 | 43. 14. 53 | 41. 32. 32 |
| 3 | | 33. 15. 35 | 31. 40. 16 | 30. 6. 42 | 28. 35. 2 |
| 4 | α Arietis. | 57. 55. 16 | 56. 6. 21 | 54. 17. 44 | 52. 29. 25 |
| 5 | | 43. 32. 47 | 41. 46. 31 | 40. 0. 36 | 38. 15. 1 |
| 6 | | 62. 4. 49 | 60. 22. 21 | 58. 40. 17 | 56. 58. 37 |
| 7 | Aldebaran. | 48. 36. 32 | 46. 57. 27 | 45. 18. 47 | 43. 40. 35 |
| 8 | | 35. 37. 28 | 34. 2. 38 | 32. 28. 29 | 30. 55. 5 |
| 9 | | 23. 22. 20 | 21. 55. 18 | 20. 30. 0 | 19. 7. 3 |
| 10 | Pollux. | 51. 3. 14 | 49. 27. 59 | 47. 52. 57 | 46. 18. 9 |
| 11 | | 38. 27. 43 | 36. 54. 20 | 35. 21. 12 | 33. 48. 17 |
| 12 | | 62. 42. 22 | 61. 9. 30 | 59. 36. 47 | 58. 4. 13 |
| 13 | Regulus. | 50. 23. 35 | 48. 51. 53 | 47. 20. 18 | 45. 48. 52 |
| 14 | | 38. 13. 40 | 36. 43. 0 | 35. 12. 28 | 33. 42. 3 |
| 15 | | 26. 11. 51 | 24. 42. 9 | 23. 12. 34 | 21. 43. 10 |
| 16 | | 68. 17. 41 | 66. 48. 34 | 65. 19. 30 | 63. 50. 31 |
| 17 | | 56. 26. 28 | 54. 57. 51 | 53. 29. 15 | 52. 0. 41 |
| 18 | Spica ♍ | 44. 38. 16 | 43. 9. 50 | 41. 41. 25 | 40. 13. 0 |
| 19 | | 32. 50. 51 | 31. 22. 21 | 29. 53. 51 | 28. 25. 19 |
| 20 | | 21. 2. 16 | 19. 33. 33 | 18. 4. 47 | 16. 36. 0 |
| 21 | Antares. | 54. 40. 6 | 53. 9. 18 | 51. 38. 17 | 50. 7. 5 |
| 22 | | 42. 27. 36 | 40. 54. 57 | 39. 22. 2 | 37. 48. 50 |
| 20 | | 120. 36. 39 | 119. 14. 38 | 117. 52. 30 | 116. 30. 15 |
| 21 | | 109. 36. 50 | 108. 13. 39 | 106. 50. 14 | 105. 26. 38 |
| 22 | | 98. 25. 11 | 97. 0. 7 | 95. 34. 48 | 94. 9. 12 |
| 23 | The Sun. | 86. 56. 45 | 85. 29. 15 | 84. 1. 25 | 82. 33. 14 |
| 24 | | 75. 6. 56 | 73. 36. 29 | 72. 5. 38 | 70. 34. 23 |
| 25 | | 62. 51. 46 | 61. 17. 54 | 59. 43. 36 | 58. 8. 51 |
| 26 | | 50. 8. 25 | 48. 30. 56 | 46. 53. 0 | 45. 14. 36 |



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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | | | | |
| 2 | ♓ Pegaſi. | 39. 50. 58 | 38. 10. 19 | 36. 30. 46 | 34. 52. 28 |
| 3 | | 65. 13. 31 | 63. 23. 32 | 61. 33. 51 | 59. 44. 25 |
| 4 | ♈ Arietis. | 50. 41. 24 | 48. 53. 46 | 47. 6. 28 | 45. 19. 27 |
| 5 | | 36. 29. 47 | 34. 44. 53 | 33. 0. 20 | 31. 16. 7 |
| 6 | | 55. 17. 21 | 53. 36. 26 | 51. 55. 59 | 50. 16. 1 |
| 7 | Aldebaran. | 42. 2. 53 | 40. 25. 41 | 38. 49. 2 | 37. 12. 57 |
| 8 | | 29. 22. 31 | 27. 50. 53 | 26. 20. 15 | 24. 50. 43 |
| 9 | | 57. 26. 37 | 55. 50. 26 | 54. 14. 28 | 52. 38. 44 |
| 10 | Pollux. | 44. 43. 36 | 43. 9. 17 | 41. 35. 12 | 40. 1. 20 |
| 11 | | 32. 15. 38 | 30. 43. 12 | 29. 11. 1 | 27. 39. 3 |
| 12 | | 56. 31. 48 | 54. 59. 33 | 53. 27. 25 | 51. 55. 26 |
| 13 | Regulus. | 44. 17. 33 | 42. 46. 23 | 41. 15. 21 | 39. 44. 26 |
| 14 | | 32. 11. 46 | 30. 41. 35 | 29. 11. 34 | 27. 41. 38 |
| 15 | | 20. 13. 55 | 18. 44. 51 | 17. 15. 54 | 15. 47. 8 |
| 16 | | 62. 21. 35 | 60. 52. 44 | 59. 23. 56 | 57. 55. 11 |
| 17 | Spica ♍ | 50. 32. 8 | 49. 3. 39 | 47. 35. 11 | 46. 6. 43 |
| 18 | | 38. 44. 36 | 37. 16. 10 | 35. 47. 44 | 34. 19. 17 |
| 19 | | 26. 56. 47 | 25. 28. 11 | 23. 59. 35 | 22. 30. 56 |
| 20 | | 60. 41. 38 | 59. 11. 30 | 57. 41. 12 | 56. 10. 42 |
| 21 | Antares. | 48. 35. 39 | 47. 4. 0 | 45. 32. 7 | 43. 59. 59 |
| 22 | | 36. 15. 22 | 34. 41. 36 | 33. 7. 32 | 31. 33. 5 |
| 20 | | 115. 7. 53 | 113. 45. 22 | 112. 22. 42 | 110. 59. 51 |
| 21 | | 104. 2. 48 | 102. 38. 43 | 101. 14. 25 | 99. 49. 55 |
| 22 | | 92. 43. 22 | 91. 17. 10 | 89. 50. 40 | 88. 23. 51 |
| 23 | The Sun. | 81. 4. 44 | 79. 35. 52 | 78. 6. 36 | 76. 36. 58 |
| 24 | | 69. 2. 45 | 67. 30. 39 | 65. 58. 7 | 64. 25. 10 |
| 25 | | 56. 33. 42 | 54. 58. 3 | 53. 21. 58 | 51. 45. 25 |
| 26 | | 43. 35. 45 | 41. 56. 29 | 40. 16. 48 | |

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Distances of ☽'s Center from ☉, and from Stars west of her.

| Days | Stars Names. | Noon | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 3 | | 38. 54. 39 | 40. 38. 0 | 42. 21. 10 | 44. 4. 9 |
| 4 | | 52. 35. 55 | 54. 17. 35 | 55. 58. 59 | 57. 40. 8 |
| 5 | | 66. 1. 21 | 67. 40. 44 | 69. 19. 50 | 70. 58. 36 |
| 6 | The Sun. | 79. 7. 48 | 80. 44. 42 | 82. 21. 18 | 83. 57. 34 |
| 7 | | 91. 54. 7 | 93. 28. 35 | 95. 2. 43 | 96. 36. 29 |
| 8 | | 104. 21. 2 | 105. 53. 17 | 107. 24. 55 | 108. 56. 26 |
| 9 | | 116. 30. 10 | 118. 0. 10 | 119. 29. 54 | 120. 59. 24 |
| 7 | | | | | |
| 8 | | 43. 30. 41 | 45. 2. 19 | 46. 34. 9 | 48. 6. 9 |
| 9 | α Pegasi. | 55. 47. 3 | 57. 19. 14 | 58. 51. 23 | 60. 23. 29 |
| 10 | | 68. 2. 48 | 69. 34. 24 | 71. 5. 47 | 72. 37. 7 |
| 11 | | 37. 5. 45 | 38. 39. 12 | 40. 12. 30 | 41. 45. 42 |
| 2 | α Arietis. | 49. 29. 42 | 51. 2. 7 | 52. 34. 24 | 54. 6. 34 |
| 13 | | 30. 50. 1 | 32. 16. 25 | 33. 43. 7 | 35. 10. 3 |
| 14 | Aldeba- | 42. 27. 7 | 43. 54. 52 | 45. 22. 37 | 46. 50. 25 |
| 15 | ran. | 54. 9. 39 | 55. 37. 28 | 57. 5. 17 | 58. 33. 5 |
| 16 | | 65. 51. 36 | 67. 19. 12 | 68. 46. 47 | 70. 14. 19 |
| 17 | | 34. 58. 34 | 36. 26. 25 | 37. 54. 17 | 39. 22. 12 |
| 18 | Pollux. | 46. 42. 14 | 48. 10. 18 | 49. 38. 25 | 51. 6. 34 |
| 19 | | 21. 26. 50 | 22. 56. 25 | 24. 24. 4 | 25. 52. 47 |
| 20 | | 33. 18. 4 | 34. 47. 29 | 36. 17. 2 | 37. 46. 45 |
| 21 | Regulus. | 45. 17. 35 | 46. 48. 21 | 48. 19. 18 | 49. 50. 26 |
| 22 | | 57. 29. 27 | 59. 2. 2 | 60. 34. 53 | 62. 8. 1 |
| 23 | | 16. 8. 6 | 17. 41. 45 | 19. 15. 54 | 20. 50. 31 |
| 24 | Spica ♍ | 28. 50. 52 | 30. 28. 22 | 32. 6. 20 | 33. 44. 45 |
| 25 | | 42. 3. 40 | 43. 44. 49 | 45. 26. 25 | 47. 8. 28 |
| 26 | | 55. 45. 41 | 57. 30. 33 | 59. 15. 53 | 61. 1. 41 |
| 27 | Antares. | 24. 5. 11 | 25. 53. 47 | 27. 42. 47 | 29. 32. 11 |
| 28 | | 38. 44. 45 | 40. 36. 18 | 42. 28. 11 | 44. 20. 23 |



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Distances of ☽'s Center from ☉, and from Stars west of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 3 | The Sun. | 45. 46. 57 | 47. 29. 32 | 49. 11. 53 | 50. 54. 1 |
| 4 | | 59. 20. 59 | 61. 1. 30 | 62. 41. 45 | 64. 21. 41 |
| 5 | | 72. 37. 4 | 74. 15. 12 | 75. 53. 3 | 77. 30. 34 |
| 6 | | 85. 33. 32 | 87. 9. 8 | 88. 44. 25 | 90. 19. 24 |
| 7 | | 98. 9. 55 | 99. 43. 7 | 101. 16. 2 | 102. 48. 40 |
| 8 | | 110. 27. 41 | 111. 58. 41 | 113. 29. 26 | 114. 59. 54 |
| 9 | | | | | |
| 7 | α Pegasi. | 37. 26. 54 | 38. 57. 20 | 40. 28. 9 | 41. 59. 17 |
| 8 | | 49. 38. 15 | 51. 10. 24 | 52. 42. 35 | 54. 14. 48 |
| 9 | | 61. 55. 32 | 63. 27. 29 | 64. 59. 20 | 66. 31. 6 |
| 10 | | 74. 8. 20 | 75. 39. 25 | 77. 10. 23 | 78. 41. 13 |
| 11 | α Arietis. | 43. 18. 45 | 44. 51. 41 | 46. 24. 28 | 47. 57. 10 |
| 12 | Aldebaran. | 25. 8. 56 | 26. 33. 22 | 27. 58. 25 | 29. 23. 58 |
| 13 | | 36. 37. 11 | 38. 4. 27 | 39. 31. 49 | 40. 59. 22 |
| 14 | | 48. 18. 16 | 49. 46. 6 | 51. 13. 55 | 52. 41. 47 |
| 15 | | 60. 0. 52 | 61. 28. 36 | 62. 56. 17 | 64. 23. 58 |
| 16 | | 71. 41. 50 | 73. 9. 19 | 74. 36. 45 | 76. 4. 9 |
| 17 | Pollux. | 40. 50. 9 | 42. 18. 7 | 43. 46. 7 | 45. 14. 10 |
| 18 | | 52. 34. 46 | 54. 3. 1 | 55. 31. 19 | 56. 59. 40 |
| 19 | Regulus. | 27. 21. 36 | 28. 50. 31 | 30. 19. 35 | 31. 48. 45 |
| 20 | | 39. 16. 36 | 40. 46. 38 | 42. 16. 47 | 43. 47. 7 |
| 21 | | 51. 21. 44 | 52. 53. 20 | 54. 25. 8 | 55. 57. 11 |
| 22 | | 63. 41. 24 | 65. 15. 8 | 66. 49. 10 | 68. 23. 31 |
| 23 | Spica ♍ | 22. 25. 37 | 24. 1. 13 | 25. 37. 17 | 27. 13. 50 |
| 24 | | 35. 23. 39 | 37. 2. 59 | 38. 42. 45 | 40. 23. 0 |
| 25 | | 48. 50. 58 | 50. 33. 58 | 52. 17. 24 | 54. 1. 20 |
| 26 | | 62. 47. 57 | 64. 34. 35 | 66. 21. 41 | 68. 9. 14 |
| 27 | Antares. | 31. 21. 58 | 33. 12. 8 | 35. 2. 39 | 36. 53. 32 |
| 28 | | 46. 12. 54 | | | |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | *Su.* | *4th Sun. after Epiphany.* |
| 2 | M. | Purification of V. Mary. |
| 3 | Tu. | Blas. On morrow of Pur. |
| 4 | W. | [3 ret. |
| 5 | Th. | Agatha. |
| 6 | F. | |
| 7 | Sa. | |
| 8 | *Su.* | *5th Sun. after Epiphany.* |
| 9 | M. | In 8 days of Pur. 4 ret. |
| 10 | Tu. | |
| 11 | W. | |
| 12 | Th. | Term ends. |
| 13 | F. | |
| 14 | Sa. | Valentine. |
| 15 | *Su.* | *Septuageſima-Sunday.* |
| 16 | M. | |
| 17 | Tu. | |
| 18 | W. | |
| 19 | Th. | |
| 20 | F. | |
| 21 | Sa. | |
| 22 | *Su.* | *Sexageſima-Sunday.* |
| 23 | M. | |
| 24 | Tu. | St. Matthias. |
| 25 | W. | |
| 26 | Th. | |
| 27 | F. | |
| 28 | Sa. | |

## Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Firſt Quarter — | 5. | 7. | 59 |
| Full Moon — | 13. | 8. | 1 |
| Laſt Quarter — | 21. | 8. | 47 |
| New Moon — | 28. | 2. | 4 |

## Other Phenomena.

D.

3. ☾ ν ♓ 14h. 49′.
6. ☾ ν Pleiadum 1h. 58′.
7. ☾ β ♉ 20h. 39′.
9. ☾ ε ♊ 6h. 38′.
11. ♄ Stationary.
☾ ☌ ♋ 16h. 22′.
15. ☾ υ ♌ 14h. 23′.
18. ☉ enters ♓ at 7h. 27′.
21. ☾ π ♍ 2h. 35′.
☾ σ ♍ 11h. 30′.
☾ α ♍ 15h. 3′.
23. ☾ λ ♐ 13h. 52′.
☾ φ ♐ 20h. 25′.
24. ☾ σ ♐ 0h. 11′.
27. ☾ θ ♒ 10h. 35′.

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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declination South. | Equat. of Time Add. | Diff. |
|---|---|---|---|---|---|---|
| | | s o ′ ″ | h ′ ″ | o ′ ″ | ′ ″ | ″ |
| 1 | Su. | 10. 12. 30. 34 | 20. 59. 55 | 17. 4. 26 | 14. 6 | 7 |
| 2 | M. | 10. 13. 31. 25 | 21. 3. 59 | 16. 47. 9 | 14. 13 | 7 |
| 3 | Tu. | 10. 14. 32. 14 | 21. 8. 2 | 16. 29. 35 | 14. 20 | 6 |
| 4 | W. | 10. 15. 33. 2 | 21. 12. 4 | 16. 11. 44 | 14. 26 | 4 |
| 5 | Th. | 10. 16. 33. 49 | 21. 16. 6 | 15. 53. 36 | 14. 30 | 4 |
| 6 | F. | 10. 17. 34. 33 | 21. 20. 5 | 15. 35. 12 | 14. 34 | 3 |
| 7 | Sa. | 10. 18. 35. 15 | 21. 24. 6 | 15. 16. 32 | 14. 37 | 3 |
| 8 | Su. | 10. 19. 35. 56 | 21. 28. 5 | 14. 57. 35 | 14. 40 | 1 |
| 9 | M. | 10. 20. 36. 35 | 21. 32. 3 | 14. 38. 26 | 14. 41 | 1 |
| 10 | Tu. | 10. 21. 37. 13 | 21. 36. 0 | 14. 19. 1 | 14. 42 | 0 |
| 11 | W. | 10. 22. 37. 49 | 21. 39. 57 | 13. 59. 22 | 14. 42 | 0 |
| 12 | Th. | 10. 23. 38. 23 | 21. 43. 52 | 13. 39. 30 | 14. 42 | 2 |
| 13 | F. | 10. 24. 38. 55 | 21. 47. 47 | 13. 19. 23 | 14. 40 | 2 |
| 14 | Sa. | 10. 25. 39. 26 | 21. 51. 42 | 12. 59. 5 | 14. 38 | 3 |
| 15 | Su. | 10. 26. 39. 56 | 21. 55. 35 | 12. 38. 32 | 14. 35 | 4 |
| 16 | M. | 10. 27. 40. 24 | 21. 59. 28 | 12. 17. 48 | 14. 31 | 4 |
| 17 | Tu. | 10. 28. 40. 50 | 22. 3. 20 | 11. 56. 55 | 14. 27 | 5 |
| 18 | W. | 10. 29. 41. 15 | 22. 7. 11 | 11. 35. 47 | 14. 22 | 6 |
| 19 | Th. | 11. 0. 41. 39 | 22. 11. 2 | 11. 14. 31 | 14. 16 | 7 |
| 20 | F. | 11. 1. 42. 2 | 22. 14. 52 | 10. 53. 3 | 14. 9 | 7 |
| 21 | Sa. | 11. 2. 42. 22 | 22. 18. 41 | 10. 31. 24 | 14. 2 | 7 |
| 22 | Su. | 11. 3. 42. 43 | 22. 22. 30 | 10. 9. 36 | 13. 55 | 9 |
| 23 | M. | 11. 4. 43. 1 | 22. 26. 18 | 9. 47. 38 | 13. 46 | 9 |
| 24 | Tu. | 11. 5. 43. 18 | 22. 30. 5 | 9. 25. 32 | 13. 37 | 10 |
| 25 | W. | 11. 6. 43. 33 | 22. 33. 52 | 9. 3. 17 | 13. 27 | 10 |
| 26 | Th. | 11. 7. 43. 47 | 22. 37. 39 | 8 40. 53 | 13. 17 | 11 |
| 27 | F. | 11. 8. 43. 59 | 22. 41. 24 | 8. 18. 23 | 13. 6 | 11 |
| 28 | Sa. | 11. 9. 44. 9 | 22. 45. 10 | 7. 55. 45 | 12. 55 | 12 |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | s ° ′ |
| 1 | 16. 16, 5 | 1. 8, 1 | 2. 32, 1 | 9, 99385 | 10. 9. 49 |
| 7 | 16. 15, 5 | 1. 7, 4 | 2. 31, 8 | 9, 99429 | 10. 9. 30 |
| 13 | 16. 14, 4 | 1. 6, 8 | 2. 31, 5 | 9, 99479 | 10. 9. 11 |
| 19 | 16. 13, 1 | 1. 6, 1 | 2. 31, 0 | 9, 99537 | 10. 8. 52 |
| 25 | 16. 11, 7 | 1. 5, 6 | 2. 30, 5 | 9, 99601 | 10. 8. 33 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Immersions. | | II. Satellite. Immersions. | | III. Satellite. Immersions. | | IV. Satellite. | | |
|---|---|---|---|---|---|---|---|---|
| Days | h ′ ″ | Days | h ′ ″ | Days | h ′ ″ | | | |
| 2 | 17*17. 53 | 1 | 23. 26. 43 | 2 | 7. 5. 41 | 11 | 5. 2. 20 | I |
| 4 | 11*46. 12 | 5 | 12*43. 2 | 9 | 11* 3. 19 | 11 | 8*51. 14 | E |
| 6 | 6. 14. 32 | 9 | 1. 59. 34 | 16 | 15* 1. 41 | 27 | 23. 1. 54 | I |
| 8 | 0. 42. 55 | 12 | 15*16. 18 | 23 | 19. 0. 50 | | | |
| 9 | 19. 11. 24 | 16 | 4. 33. 13 | | | | | |
| 11 | 13*39. 54 | 19 | 17*50. 21 | | | | | |
| 13 | 8* 8. 22 | 23 | 7. 7. 43 | | | | | |
| 15 | 2. 36. 58 | 26 | 20. 25. 14 | | | | | |
| 16 | 21. 5. 34 | | | | | | | |
| 18 | 15*34. 14 | | | | | | | |
| 20 | 10* 2. 55 | | | | | | | |
| 22 | 4. 31. 41 | | | | | | | |
| 23 | 23. 0. 25 | | | | | | | |
| 25 | 17*29. 16 | | | | | | | |
| 27 | 11*58. 6 | | | | | | | |

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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| **MERCURY.** | | | | | | |
| 1 | 8. 0. 4 | 1. 45 S | 9. 21. 5 | 0. 40 S | 22. 29 S | 22. 33 |
| 7 | 8. 16. 35 | 3. 37 | 9. 29. 45 | 1. 19 | 21. 32 | 22. 45 |
| 13 | 9. 3. 16 | 5. 11 | 10. 8. 59 | 1. 48 | 19. 45 | 23. 1 |
| 19 | 9. 20. 56 | 6. 21 | 10. 18. 43 | 2. 4 | 17. 12 | 23. 18 |
| 25 | 10. 10. 27 | 6. 58 | 10. 29. 3 | 2. 6 | 13. 47 | 23. 36 |
| **VENUS.** | | | | | | |
| 1 | 10. 25. 12 | 3. 12 S | 10. 17. 54 | 1. 22 S | 16. 48 S | 0. 23 |
| 7 | 11. 4. 43 | 3. 20 | 10. 25. 25 | 1. 26 | 14. 25 | 0. 29 |
| 13 | 11. 14. 14 | 3. 23 | 11. 2. 55 | 1. 28 | 11. 48 | 0. 34 |
| 19 | 11. 23. 46 | 3. 21 | 11. 10. 25 | 1. 27 | 9. 1 | 0. 39 |
| 25 | 0. 3. 18 | 3. 13 | 11. 17. 55 | 1. 24 | 6. 4 | 0. 44 |
| **MARS.** | | | | | | |
| 1 | 2. 3. 22 | 0. 29 N | 0. 24. 59 | 0. 30 N | 10. 9 N | 4. 31 |
| 7 | 2. 6. 31 | 0. 35 | 0. 28. 54 | 0. 35 | 11. 39 | 4. 23 |
| 13 | 2. 9. 38 | 0. 41 | 1. 2. 46 | 0. 39 | 13. 3 | 4. 13 |
| 19 | 2. 12. 44 | 0. 46 | 1. 6. 43 | 0. 43 | 14. 27 | 4. 5 |
| 25 | 2. 15. 47 | 0. 52 | 1. 10. 37 | 0. 47 | 15. 46 | 3. 58 |
| **JUPITER.** | | | | | | |
| 1 | 5. 15. 23 | 1. 13 N | 5. 22. 2 | 1. 25 N | 4. 28 N | 14. 32 |
| 7 | 5. 15. 51 | 1. 13 | 5. 21. 30 | 1. 27 | 4. 42 | 14. 6 |
| 13 | 5. 16. 18 | 1. 13 | 5. 20. 56 | 1. 29 | 4. 58 | 13. 40 |
| 19 | 5. 16. 46 | 1. 14 | 5. 20. 15 | 1. 29 | 5. 14 | 13. 14 |
| 25 | 5. 17. 13 | 1. 14 | 5. 19. 33 | 1. 30 | 5. 32 | 12. 49 |
| **SATURN.** | | | | | | |
| 1 | 2. 18. 10 | 1. 22. S | 2. 12. 44 | 1. 27 S | 20. 54 N | 7. 45 |
| 7 | 2. 18. 23 | 1. 22. | 2. 12. 38 | 1. 26 | 20. 54 | 7. 20 |
| 13 | 2. 18. 37 | 1. 21. | 2. 12. 37 | 1. 25 | 20. 55 | 6. 56 |
| 19 | 2. 18. 50 | 1. 21. | 2. 12. 42 | 1. 23 | 20. 57 | 6. 34 |
| 25 | 2. 19. 4 | 1. 20. | 2. 12. 47 | 1. 22 | 20. 59 | 6. 11 |

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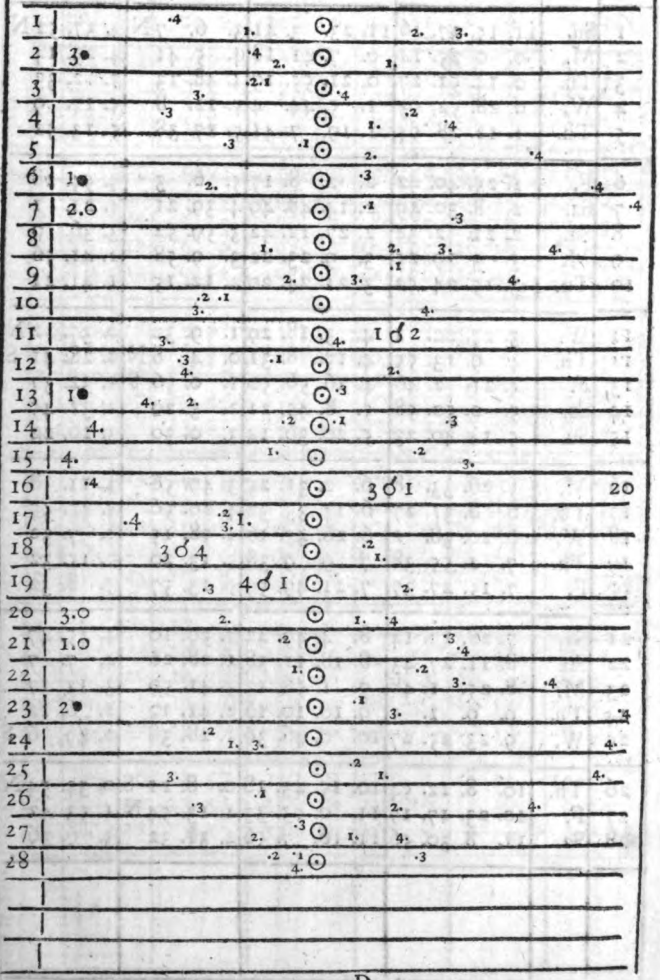
## Configurations of the SATELLITES of JUPITER at 9 o'th' Clock in the Evening.



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| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. S ° ′ ″ | Moon's Longitude at Midnight. S ° ′ ″ | Moon's Latitude at Noon. ° ′ ″ | Moon's Latitude at Midnight. ° ′ ″ |
|---|---|---|---|---|---|
| 1 | Su. | 11. 15. 37. 16 | 11. 23. 3. 41 | 3. 6. 7 N | 3. 37. 51 N |
| 2 | M. | 0. 0. 25. 14 | 0. 7. 41. 18 | 4. 5. 41 | 4. 29. 14 |
| 3 | Tu. | 0. 14. 51. 27 | 0. 21. 55. 19 | 4. 48. 13 | 5. 2. 33 |
| 4 | W. | 0. 28. 52. 53 | 1. 5. 44. 4 | 5. 12. 8 | 5. 17. 9 |
| 5 | Th. | 1. 12. 28. 54 | 1. 19. 7. 41 | 5. 17. 38 | 5. 13. 52 |
| 6 | F. | 1. 25. 40. 42 | 2. 2. 8. 17 | 5. 6. 3 | 4. 54. 28 |
| 7 | Sa. | 2. 8. 30. 49 | 2. 14. 48. 49 | 4. 39. 21 | 4. 21. 1 |
| 8 | Su. | 2. 21. 2. 34 | 2. 27. 12. 42 | 3. 59. 52 | 3. 36. 0 |
| 9 | M. | 3. 3. 19. 25 | 3. 9. 23. 22 | 3. 9. 58 | 2. 41. 56 |
| 10 | Tu. | 3. 15. 24. 52 | 3. 21. 24. 20 | 2. 12. 15 | 1. 41. 21 |
| 11 | W. | 3. 27. 22. 1 | 4. 3. 18. 29 | 1. 9. 32 | 0. 37. 2 N |
| 12 | Th. | 4. 9. 13. 55 | 4. 15. 8. 31 | 0. 4. 8 N | 0. 28. 41 S |
| 13 | F. | 4. 21. 2. 46 | 4. 26. 56. 50 | 1. 0. 56 S | 1. 32. 37 |
| 14 | Sa. | 5. 2. 50. 58 | 5. 8. 45. 21 | 2. 3. 29 | 2. 32. 45 |
| 15 | Su. | 5. 14. 40. 23 | 5. 20. 36. 14 | 3. 0. 30 | 3. 26. 22 |
| 16 | M. | 5. 26. 33. 8 | 6. 2. 31. 25 | 3. 49. 58 | 4. 11. 18 |
| 17 | Tu. | 6. 8. 31. 27 | 6. 14. 33. 32 | 4. 29. 56 | 4. 45. 45 |
| 18 | W. | 6. 20. 38. 2 | 6. 26. 45. 16 | 4. 58. 15 | 5. 7. 32 |
| 19 | Th. | 7. 2. 55. 38 | 7. 9. 9. 38 | 5. 13. 20 | 5. 15. 32 |
| 20 | F. | 7. 15. 27. 37 | 7. 21. 49. 59 | 5. 13. 57 | 5. 8. 32 |
| 21 | Sa. | 7. 28. 17. 14 | 8. 4. 49. 42 | 4. 59. 10 | 4. 45. 47 |
| 22 | Su. | 8. 11. 27. 43 | 8. 18. 11. 38 | 4. 28. 26 | 4. 7. 7 |
| 23 | M. | 8. 25. 1. 48 | 9. 1. 58. 12 | 3. 41. 59 | 3. 13. 17 |
| 24 | Tu. | 9. 9. 1. 5 | 9. 16. 10. 16 | 2. 41. 12 | 2. 6. 12 |
| 25 | W. | 9. 23. 25. 27 | 10. 0. 46. 36 | 1. 28. 38 | 0. 49. 6 S |
| 26 | Th. | 10. 8. 12. 54 | 10. 15. 43. 18 | 0. 8. 21 S | 0. 32. 54 N |
| 27 | F. | 10. 23. 17. 17 | 11. 0. 53. 33 | 1. 13. 54 N | 1. 53. 42 |
| 28 | Sa. | 11. 8. 30. 56 | 11. 16. 7. 56 | 2. 31. 32 | 3. 6. 36 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Paſſage over Merid. | ☽'s Right Aſcen. at Noon. | ☽ Right Aſc. at Midn. | ☽'s Declinat. at Noon. | ☽'s Declin. at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h / | ° / | ° / | ° / | ° / |
| 1 | Su. | 4 | 2. 7 | 345. 34 | 352. 12 | 2. 49 S | 0. 35 N |
| 2 | M. | 5 | 2. 57 | 358. 45 | 5. 18 | 3. 56 N | 7. 10 |
| 3 | Tu. | 6 | 3. 46 | 11. 48 | 18. 19 | 10. 17 | 13. 14 |
| 4 | W. | 7 | 4. 37 | 24. 55 | 31. 34 | 15. 58 | 18. 26 |
| 5 | Th. | 8 | 5. 29 | 38. 19 | 45. 8 | 20. 37 | 22. 33 |
| 6 | F. | 9 | 6. 21 | 52. 1 | 58. 58 | 24. 9 | 25. 25 |
| 7 | Sa. | 10 | 7. 15 | 65. 57 | 72. 58 | 26. 18 | 26. 56 |
| 8 | Su. | 11 | 8. 9 | 79. 57 | 86. 52 | 27. 10 | 27. 5 |
| 9 | M. | 12 | 9. 2 | 93. 42 | 100. 25 | 26. 36 | 25. 50 |
| 10 | Tu. | 13 | 9. 52 | 107. 0 | 113. 26 | 24. 45 | 23. 26 |
| 11 | W. | 14 | 10. 38 | 119. 42 | 125. 46 | 21. 52 | 20. 3 |
| 12 | Th. | 15 | 11. 22 | 131. 41 | 137. 28 | 18. 2 | 15. 51 |
| 13 | F. | 16 | 12. 5 | 143. 6 | 148. 38 | 13. 32 | 11. 6 |
| 14 | Sa. | 17 | 12. 45 | 154. 4 | 159. 25 | 8. 33 | 5. 56 |
| 15 | Su. | 18 | 13. 25 | 164. 44 | 170. 1 | 3. 16 N | 0. 34 N |
| 16 | M. | 19 | 14. 5 | 175. 19 | 180. 39 | 2. 8 S | 4. 51 S |
| 17 | Tu. | 20 | 14. 44 | 186. 2 | 191. 32 | 7. 30 | 10. 8 |
| 18 | W. | 21 | 15. 28 | 197. 8 | 202. 54 | 12. 40 | 15. 6 |
| 19 | Th. | 22 | 16. 14 | 208. 50 | 214. 59 | 17. 24 | 19. 33 |
| 20 | F. | 23 | 17. 4 | 221. 21 | 227. 56 | 21. 29 | 23. 13 |
| 21 | Sa. | 24 | 18. 1 | 234. 48 | 241. 55 | 24. 41 | 25. 49 |
| 22 | Su. | 25 | 19. 0 | 249. 14 | 256. 45 | 26. 37 | 27. 1 |
| 23 | M. | 26 | 19. 59 | 264. 26 | 272. 12 | 27. 4 | 26. 41 |
| 24 | Tu. | 27 | 21. 1 | 280. 0 | 287. 49 | 25. 52 | 24. 35 |
| 25 | W. | 28 | 22. 0 | 295. 34 | 303. 11 | 22. 54 | 20. 49 |
| 26 | Th. | 29 | 22. 57 | 310. 40 | 318. 1 | 18. 21 | 15. 37 |
| 27 | F. | 30 | 23. 51 | 325. 13 | 332. 16 | 12. 36 | 9. 24 |
| 28 | Sa. | 1 | ♂ | 339. 12 | 346. 2 | 6. 3 S | 2. 37 S |



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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Su. | 16. 36 | 16. 31 | 60. 57 | 60. 38 | 9932 | 9954 |
| 2 | M. | 16. 26 | 16. 20 | 60. 18 | 59. 55 | 9978 | 0006 |
| 3 | Tu. | 16. 13 | 16. 5 | 59. 30 | 59. 3 | 0036 | 0069 |
| 4 | W. | 15. 58 | 15. 51 | 58. 37 | 58. 10 | 0101 | 0135 |
| 5 | Th. | 15. 44 | 15. 37 | 57. 44 | 57. 19 | 0167 | 0199 |
| 6 | F. | 15. 30 | 15. 24 | 56. 54 | 56. 32 | 0230 | 0258 |
| 7 | Sa. | 15. 18 | 15. 13 | 56. 10 | 55. 51 | 0287 | 0311 |
| 8 | Su. | 15. 8 | 15. 4 | 55. 33 | 55. 17 | 0335 | 0356 |
| 9 | M. | 15. 0 | 14. 56 | 55. 2 | 54. 50 | 0375 | 0391 |
| 10 | Tu. | 14. 53 | 14. 51 | 54. 39 | 54. 30 | 0406 | 0418 |
| 11 | W. | 14. 49 | 14. 47 | 54. 22 | 54. 15 | 0428 | 0438 |
| 12 | Th. | 14. 46 | 14. 45 | 54. 10 | 54. 7 | 0444 | 0448 |
| 13 | F. | 14. 44 | 14. 44 | 54. 4 | 54. 3 | 0452 | 0454 |
| 14 | Sa. | 14. 44 | 14. 44 | 54. 4 | 54. 5 | 0452 | 0451 |
| 15 | Su. | 14. 45 | 14. 46 | 54. 7 | 54. 13 | 0448 | 0440 |
| 16 | M. | 14. 48 | 14. 50 | 54. 19 | 54. 26 | 0432 | 0423 |
| 17 | Tu. | 14. 52 | 14. 55 | 54. 35 | 54. 46 | 0411 | 0396 |
| 18 | W. | 14. 59 | 15. 3 | 54. 59 | 55. 13 | 0379 | 0361 |
| 19 | Th. | 15. 7 | 15. 12 | 55. 30 | 55. 48 | 0339 | 0315 |
| 20 | F. | 15. 18 | 15. 24 | 56. 8 | 56. 30 | 0289 | 0261 |
| 21 | Sa. | 15. 30 | 15. 37 | 56. 54 | 57. 18 | 0230 | 0200 |
| 22 | Su. | 15. 44 | 15. 51 | 57. 44 | 58. 11 | 0167 | 0134 |
| 23 | M. | 15. 59 | 16. 6 | 58. 40 | 59. 6 | 0098 | 0066 |
| 24 | Tu. | 16. 14 | 16. 21 | 59. 33 | 59. 59 | 0033 | 0002 |
| 25 | W. | 16. 27 | 16. 33 | 60. 22 | 60. 43 | 9974 | 9948 |
| 26 | Th. | 16. 37 | 16. 41 | 61. 1 | 61. 15 | 9927 | 9910 |
| 27 | F. | 16. 44 | 16. 45 | 61. 24 | 61. 29 | 9900 | 9894 |
| 28 | Sa. | 16. 45 | 16. 44 | 61. 29 | 61. 23 | 9894 | 9901 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | α Arietis. | 48. 54. 15 | 47. 2. 48 | 45. 11. 41 | 43. 20. 55 |
| 2 | | 66. 43. 40 | 64. 56. 16 | 63. 9. 20 | 61. 22. 53 |
| 3 | Aldebaran. | 52. 37. 40 | 50. 54. 8 | 49. 11. 11 | 47. 28. 46 |
| 4 | | 39. 5. 41 | 37. 26. 58 | 35. 49. 3 | 34. 11. 53 |
| 5 | | 26. 19. 51 | 24. 48. 51 | 23. 19. 19 | 21. 51. 27 |
| 6 | Pollux. | 54. 2. 54 | 52. 26. 23 | 50. 50. 13 | 49. 14. 23 |
| 7 | | 41. 20. 11 | 39. 46. 18 | 38. 12. 42 | 36. 39. 27 |
| 8 | | 65. 35. 22 | 64. 2. 37 | 62. 30. 4 | 60. 57. 43 |
| 9 | | 53. 18. 51 | 51. 47. 36 | 50. 16. 28 | 48. 45. 31 |
| 10 | Regulus. | 41. 12. 44 | 39. 42. 34 | 38. 12. 31 | 36. 42. 34 |
| 11 | | 29. 14. 29 | 27. 45. 8 | 26. 15. 52 | 24. 46. 43 |
| 12 | | 17. 22. 31 | 16. 54. 8 | 14. 25. 53 | 12. 57. 49 |
| 13 | | 59. 32. 22 | 58. 3. 39 | 56. 34. 58 | 55. 6. 17 |
| 14 | Spica ♍ | 47. 43. 8 | 46. 14. 32 | 44. 45. 57 | 43. 17. 21 |
| 15 | | 35. 54. 15 | 34. 25. 36 | 32. 56. 56 | 31. 28. 16 |
| 16 | | 24. 4. 56 | 22. 36. 15 | 21. 7. 37 | 19. 39. 6 |
| 17 | | 57. 47. 41 | 56. 17. 34 | 54. 47. 18 | 53. 16. 55 |
| 18 | Antares. | 45. 43. 0 | 44. 11. 47 | 42. 40. 24 | 41. 8. 51 |
| 19 | | 33. 28. 15 | 31. 55. 29 | 30. 22. 29 | 28. 49. 16 |
| 20 | | 20. 59. 27 | 19. 24. 40 | 17. 49. 35 | 16. 14. 15 |
| 21 | α Aquilæ. | 67. 5. 51 | 65. 44. 29 | 64. 23. 16 | 63. 2. 11 |
| 19 | | 117. 38. 33 | 116. 13. 22 | 114. 47. 58 | 113. 22. 17 |
| 20 | | 106. 10. 15 | 104. 43. 4 | 103. 15. 34 | 101. 47. 47 |
| 21 | | 94. 24. 7 | 92. 54. 25 | 91. 24. 22 | 89. 53. 58 |
| 22 | The Sun. | 82. 16. 24 | 80. 43. 45 | 79. 10. 43 | 77. 37. 16 |
| 23 | | 69. 43. 51 | 68. 7. 56 | 66. 31. 36 | 64. 54. 51 |
| 24 | | 56. 44 41 | 55. 5. 23 | 53. 25. 41 | 51. 45. 36 |
| 25 | | 43. 19. 18 | 41. 36. 52 | 39. 54. 6 | 38. 11. 0 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | α Arietis. | 41. 30. 28 | 39. 40. 31 | 37. 50. 57 | 36. 1. 46 |
| 2 | Aldebaran. | 59. 36. 54 | 57. 51. 22 | 56. 6. 20 | 54. 21. 45 |
| 3 | | 45. 46. 57 | 44. 5. 44 | 42. 25. 6 | 40. 45. 5 |
| 4 | | 32. 35. 32 | 31. 0. 4 | 29. 25. 34 | 27. 52. 8 |
| 5 | Pollux. | 60. 32. 24 | 58. 54. 29 | 57. 16. 57 | 55. 39. 44 |
| 6 | | 47. 38. 54 | 46. 3. 43 | 44. 28. 52 | 42. 54. 22 |
| 7 | | 35. 6. 30 | 33. 33. 52 | 32. 1. 33 | 30. 29. 32 |
| 8 | Regulus. | 59. 25. 34 | 57. 53. 36 | 56. 21. 50 | 54. 50. 15 |
| 9 | | 47. 14. 41 | 45. 44. 0 | 44. 13. 27 | 42. 43. 1 |
| 10 | | 35. 12. 44 | 33. 42. 59 | 32. 13. 24 | 30. 43. 54 |
| 11 | | 23. 17. 40 | 21. 48. 41 | 20. 19. 49 | 18. 51. 6 |
| 12 | Spica ♍ | 65. 27. 27 | 63. 58. 38 | 62. 29. 52 | 61. 1. 6 |
| 13 | | 53. 37. 38 | 52. 8. 59 | 50. 40. 21 | 49. 11. 44 |
| 14 | | 41. 48. 46 | 40. 20. 9 | 38. 51. 31 | 37. 22. 54 |
| 15 | | 29. 59. 37 | 28. 30. 55 | 27. 2. 13 | 25. 33. 34 |
| 16 | | 18. 10. 40 | 16. 42. 21 | 15. 14. 12 | 13. 46. 12 |
| 17 | Antares. | 51. 46. 24 | 50. 15. 46 | 48. 44. 59 | 47. 14. 4 |
| 18 | | 39. 37. 8 | 38. 5. 12 | 36. 33. 3 | 35. 0. 45 |
| 19 | | 27. 15. 50 | 25. 42. 6 | 24. 8. 8 | 22. 33. 55 |
| 20 | α Aquilæ. | 72. 31. 36 | 71. 10. 10 | 69. 48. 44 | 68. 27. 17 |
| 21 | | 61. 41. 15 | 60. 20. 32 | 59. 0. 3 | 57. 39. 50 |
| 19 | The Sun. | 111. 56. 22 | 110. 30. 14 | 109. 3. 51 | 107. 37. 10 |
| 20 | | 100. 19. 42 | 98. 51. 17 | 97. 22. 33 | 95. 53. 30 |
| 21 | | 88. 23. 13 | 86. 52. 4 | 85. 20. 33 | 83. 48. 39 |
| 22 | | 76. 3. 26 | 74. 29. 9 | 72. 54. 28 | 71. 19. 22 |
| 23 | | 63. 17. 41 | 61. 40. 4 | 60. 2. 1 | 58. 23. 34 |
| 24 | | 50. 5. 6 | 48. 24. 13 | 46. 42. 57 | 45. 1. 19 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 2 | The Sun. | 47. 2. 1 | 48. 43. 55 | 50. 25. 25 | 52. 6. 31 |
| 3 | | 60. 26. 5 | 62. 4. 45 | 63. 43. 2 | 65. 20. 53 |
| 4 | | 73. 24. 8 | 74. 59. 32 | 76. 34. 32 | 78. 9. 6 |
| 5 | | 85. 56. 5 | 87. 28. 21 | 89. 0. 15 | 90. 31. 48 |
| 6 | | 98. 4. 16 | 99. 33. 44 | 101. 2. 53 | 102. 31. 44 |
| 7 | | 109. 51. 26 | 111. 18. 35 | 112. 45. 28 | 114. 12. 5 |
| 6 | α Pegaſi. | 65. 9. 38 | 66. 42. 10 | 68. 14. 30 | 69. 46. 39 |
| 7 | α Arietis. | 34. 13. 10 | 35. 46. 55 | 37. 20. 29 | 38. 53. 51 |
| 8 | | 46. 37. 44 | 48. 9. 59 | 49. 42. 2 | 51. 13. 57 |
| 9 | Aldebaran. | 28. 6. 48 | 29. 31. 51 | 30. 57. 15 | 32. 22. 57 |
| 10 | | 39. 34. 53 | 41. 1. 44 | 42. 28. 40 | 43. 55. 41 |
| 11 | | 51. 11. 26 | 52. 38. 42 | 54. 6. 1 | 55. 33. 19 |
| 12 | | 62. 50. 0 | 64. 17. 20 | 65. 44. 39 | 67. 11. 59 |
| 13 | Pollux. | 31. 54. 28 | 33. 22. 17 | 34. 50. 9 | 36. 18. 4 |
| 14 | | 43. 38. 14 | 45. 6. 23 | 46. 34. 36 | 48. 2. 50 |
| 15 | Regulus. | 18. 23. 31 | 19. 52. 3 | 21. 20. 40 | 22. 49. 22 |
| 16 | | 30. 14. 4 | 31. 43. 15 | 33. 12. 32 | 34. 41. 54 |
| 17 | | 42. 10. 22 | 43. 40. 22 | 45. 10. 31 | 46. 40. 47 |
| 18 | | 54. 14. 14 | 55. 45. 23 | 57. 16. 42 | 58. 48. 12 |
| 19 | Spica ♍ | 12. 42. 18 | 14. 12. 59 | 15. 44. 8 | 17. 15. 45 |
| 20 | | 25. 0. 35 | 26. 34. 41 | 28. 9. 9 | 29. 43. 58 |
| 21 | | 37. 43. 27 | 39. 20. 25 | 40. 57. 44 | 42. 35. 27 |
| 22 | | 50. 49. 37 | 52. 29. 38 | 54. 10. 4 | 55. 50. 54 |
| 23 | | 64. 21. 26 | 66. 4. 48 | 67. 48. 34 | 69. 32. 47 |
| 24 | Antares. | 32. 29. 13 | 34. 16. 4 | 36. 3. 27 | 37. 51. 11 |
| 25 | | 46. 55. 56 | 48. 46. 6 | 50. 36. 38 | 52. 27. 31 |
| 26 | | 61. 46. 54 | 63. 39. 37 | 65. 32. 35 | 67. 25. 46 |
| 27 | | | | | |

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Distances of ☽'s Center from ☉, and from Stars west of her

| Days | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 40. 10. 52 | 41. 54. 11 | 43. 37. 9 | 45. 19. 46 |
| 2 | | 53. 47. 13 | 55. 27. 32 | 57. 7. 27 | 58. 46. 58 |
| 3 | | 66. 58. 20 | 68. 35. 24 | 70. 12. 3 | 71. 48. 18 |
| 4 | The Sun. | 79. 43. 17 | 81. 17. 4 | 82. 50 27 | 84. 23. 28 |
| 5 | | 92. 2. 59 | 93. 33. 49 | 95. 4 18 | 96. 34. 28 |
| 6 | | 104. 0. 15 | 105. 28. 28 | 106. 56. 24 | 108. 24. 4 |
| 7 | | 115. 38. 27 | 117. 4. 35 | 118. 30. 29 | 119. 56. 7 |
| 6 | α Pegasi. | 71. 18. 35 | 72. 50. 18 | 74. 21. 50 | 75. 53. 9 |
| 7 | α Arietis. | 40. 27. 0 | 41. 59. 58 | 43. 32. 44 | 45. 5. 19 |
| 8 | | 52. 45. 40 | 54. 17. 14 | 55. 48. 36 | 57. 19. 50 |
| 9 | | 33. 48. 53 | 35. 15. 8 | 36. 41. 31 | 38. 8. 8 |
| 10 | Aldebaran. | 45. 22. 46 | 46. 49. 52 | 48. 17. 1 | 49. 44. 12 |
| 11 | | 57. 0. 40 | 58. 28. 0 | 59. 55. 19 | 61. 22. 40 |
| 12 | | 68. 39. 18 | 70. 6. 38 | 71. 34. 0 | 73. 1. 23 |
| 13 | Pollux. | 37. 46. 1 | 39. 14. 0 | 40. 42. 2 | 42. 10. 7 |
| 14 | | 49. 31. 8 | 50. 59. 29 | 52. 27. 52 | 53. 56. 18 |
| 15 | | 24. 18. 8 | 25. 46. 59 | 27. 15. 56 | 28. 44. 57 |
| 16 | Regulus. | 36. 11. 23 | 37. 40. 58 | 39. 10. 39 | 40. 40. 27 |
| 17 | | 48. 11. 11 | 49. 41. 43 | 51. 12. 24 | 52. 43. 14 |
| 18 | | 60. 19. 51 | 61. 51. 43 | 63. 23. 47 | 64. 56. 2 |
| 19 | | 18. 47. 48 | 20. 20. 24 | 21. 53. 22 | 23. 26. 47 |
| 20 | | 31. 19. 9 | 32. 54. 41 | 34. 30. 35 | 36. 6. 50 |
| 21 | Spica ♍ | 44. 13. 29 | 45. 51. 56 | 47. 30. 46 | 49. 10. 0 |
| 22 | | 57. 32. 9 | 59. 13. 50 | 60. 55. 57 | 62. 38. 29 |
| 23 | | 71. 17. 25 | 73. 2. 30 | 74. 48. 1 | 76. 32. 58 |
| 24 | | 39. 39. 21 | 41. 27. 54 | 43. 16. 51 | 45. 6. 12 |
| 25 | Antares. | 54. 18. 46 | 56. 10. 21 | 58. 2. 14 | 59. 54. 25 |
| 26 | | 69. 19. 12 | 71. 12. 49 | 73. 6. 39 | 75. 0. 42 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | *Su.* | *Quinquageſima, or Shrove-* |
| 2 | M. | Chad. [*Sunday.* |
| 3 | Tu. | |
| 4 | W. | Aſh-Wedneſday. |
| 5 | Th. | Prs. of Heſſe born. |
| 6 | F. | |
| 7 | Sa. | Perpetua. |
| 8 | *Su.* | *1ſt. Sunday in Lent.* |
| 9 | M. | |
| 10 | Tu | |
| 11 | W. | |
| 12 | Th. | Gregory M. |
| 13 | F. | |
| 14 | Sa. | |
| 15 | *Su.* | *2d. Sunday in Lent.* |
| 16 | M. | |
| 17 | Tu. | |
| 18 | W. | Edw. K. of Weſt-Sax. |
| 19 | Th. | Prs. Louiſa-Ann born. |
| 20 | F. | |
| 21 | Sa. | Benedict. |
| 22 | *Su.* | *3d. Sunday in Lent.* |
| 23 | M. | |
| 24 | Tu. | [D. of York born. |
| 25 | W. | Annunciat. of the V.M. |
| 26 | Th. | |
| 27 | F. | |
| 28 | Sa. | [*Sunday.* |
| 29 | *Su.* | *4th Sun. in Lent, Midlent* |
| 30 | M. | |
| 31 | Tu. | |

Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Firſt Quarter — | 6. | 22. | 10 |
| Full Moon —— | 15. | 2. | 40 |
| Laſt Quarter—— | 22. | 20. | 16 |
| New Moon—— | 29. | 11. | 39 |

Other Phenomena.

D.

3. ☾ ☍ ♓ $0^h$ 12′
5. ☾ ☍ Pleiadum $9^h$ 26′. Some of the Pleiades will be eclipſed.
7. ♂ ☌ ♈ diff. Lat. 55′
8. ☾ ☌ ♊ $12^h$ 48′
10. ☾ ☌ ♋ $22^h$ 33′
14. ☾ ☍ ♑ $20^h$ 35′
15. ♄ ☍ ♂ diff. Lat. 3′
20. ☉ enters ♈ at $8^h$ 1′
♀ ☌ ♓ diff. Lat. 39′
☾ ☌ ♍ $8^h$ 39′
☾ ☌ ♍ $17^h$ 42′
☾ ☌ ♍ $21^h$ 18′
21. ☾ ſeq. θ Ophiuchi $19^h$ 27′
22. ☾ ☌ ♐ $21^h$ 18′
23. ☾ ☌ ♐ $7^h$ 56′
26. ☾ ☌ ♒ $21^h$ 9′
29. ☿ ☌ ♑ diff. Lat. 10′



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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declin. South. | Equat. of Time Add. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | Su. | 11. 10. 44. 18 | 22. 48. 55 | 7. 33. 0 | 12. 43 | 13 |
| 2 | M. | 11. 11. 44. 25 | 22. 52. 39 | 7. 10. 8 | 12. 30 | 13 |
| 3 | Tu. | 11. 12. 44. 29 | 22. 56. 23 | 6. 47. 11 | 12. 17 | 13 |
| 4 | W. | 11. 13. 44. 32 | 23. 0. 6 | 6. 24. 8 | 12. 4 | 14 |
| 5 | Th. | 11. 14. 44. 32 | 23. 3. 49 | 6. 0. 59 | 11. 50 | 14 |
| 6 | F. | 11. 15. 44. 30 | 23. 7. 31 | 5. 37. 47 | 11. 36 | 15 |
| 7 | Sa. | 11. 16. 44. 25 | 23. 11. 13 | 5. 14. 29 | 11. 21 | 15 |
| 8 | Su. | 11. 17. 44. 16 | 23. 14. 54 | 4. 51. 9 | 11. 6 | 15 |
| 9 | M. | 11. 18. 44. 9 | 23. 18. 35 | 4. 27. 43 | 10. 51 | 16 |
| 10 | Tu. | 11. 19. 43. 58 | 23. 22. 16 | 4. 4. 15 | 10. 35 | 16 |
| 11 | W. | 11. 20. 43. 45 | 23. 25. 56 | 3. 40. 44 | 10. 19 | 16 |
| 12 | Th. | 11. 21. 43. 29 | 23. 29. 36 | 3. 17. 11 | 10. 3 | 17 |
| 13 | F. | 11. 22. 43. 11 | 23. 33. 16 | 2. 53. 35 | 9. 46 | 17 |
| 14 | Sa. | 11. 23. 42. 51 | 23. 36. 55 | 2. 29. 58 | 9. 29 | 17 |
| 15 | Su. | 11. 24. 42. 28 | 23. 40. 34 | 2. 6. 18 | 9. 12 | 18 |
| 16 | M. | 11. 25. 42. 4 | 23. 44. 13 | 1. 42. 39 | 8. 54 | 17 |
| 17 | Tu. | 11. 26. 41. 38 | 23. 47. 52 | 1. 18. 58 | 8. 37 | 19 |
| 18 | W. | 11. 27. 41. 10 | 23. 51. 31 | 0. 55. 17 | 8. 18 | 17 |
| 19 | Th. | 11. 28. 40. 40 | 23. 55. 9 | 0. 31. 36 | 8. 1 | 19 |
| 20 | F. | 11. 29. 40. 8 | 23. 58. 47 | 0. 7. 55 | 7. 42 | 18 |
| | | | | North. | | |
| 21 | Sa. | 0. 0. 39. 35 | 0. 2. 25 | 0. 15. 46 | 7. 24 | 18 |
| 22 | Su. | 0. 1. 39. 0 | 0. 6. 3 | 0. 39. 26 | 7. 6 | 19 |
| 23 | M. | 0. 2. 38. 23 | 0. 9. 41 | 1. 3. 4 | 6. 47 | 19 |
| 24 | Tu. | 0. 3. 37. 45 | 0. 13. 19 | 1. 26. 41 | 6. 28 | 19 |
| 25 | W. | 0. 4. 37. 4 | 0. 16. 57 | 1. 50. 15 | 6. 9 | 18 |
| 26 | Th. | 0. 5. 36. 23 | 0. 20. 35 | 2. 13. 48 | 5. 51 | 19 |
| 27 | F. | 0. 6. 35. 39 | 0. 24. 13 | 2. 37. 17 | 5. 32 | 19 |
| 28 | Sa. | 0. 7. 34. 53 | 0. 27. 51 | 3. 0. 44 | 5. 13 | 19 |
| 29 | Su. | 0. 8. 34. 6 | 0. 31. 28 | 3. 24. 7 | 4. 54 | 18 |
| 30 | M. | 0. 9. 33. 16 | 0. 35. 6 | 3. 47. 26 | 4. 36 | 19 |
| 31 | Tu. | 0. 10. 32. 24 | 0. 38. 44 | 4. 10. 41 | 4. 17 | |

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| Days. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | ☊ ° ′ |
| 1 | 16. 10, 7 | 1. 5, 3 | 2. 30, 2 | 9. 99645 | 10. 8. 21 |
| 7 | 16. 9, 2 | 1. 4, 9 | 2. 29, 7 | 9. 99712 | 10. 8. 1 |
| 13 | 16. 7, 5 | 1. 4, 6 | 2. 29, 2 | 9. 99782 | 10. 7. 42 |
| 19 | 16. 5, 9 | 1. 4, 4 | 2. 28, 8 | 9. 99856 | 10. 7. 23 |
| 25 | 16. 4. 3 | 1. 4. 3 | 2. 28, 3 | 9. 99933 | 10. 7. 4 |

## Eclipſes of the SATELLITES of JUPITER.

| I. Satellite. Immerſions. | | II. Satellite. Immerſions. | | III. Satellite. Immerſions. | |
|---|---|---|---|---|---|
| D. | h ′ ″ | D. | h ′ ″ | D. | h ′ ″ |
| 1 | 6*27. 1 | 2 | 9*42. 56 | 2 | 23. 0. 36 |
| 3 | 0. 55. 57 | 5 | 23. 0. 47 | | Emerſions. |
| 4 | 19. 24. 53 | | Emerſions. | 10 | 6. 11. 25 |
| 6 | 13*53. 53 | 9 | 15* 2. 5 | 17 | 10*11. 19 |
| 8 | 8*22. 52 | 13 | 4. 20. 10 | 24 | 14*11. 30 |
| | Emerſions. | 16 | 17. 38. 20 | 31 | 18. 12. 26 |
| 10 | 5. 5. 12 | 20 | 6*56. 37 | | |
| 11 | 23. 34. 14 | 23 | 20. 15. 3 | IV. Satellite. | |
| 13 | 18. 3. 19 | 27 | 9*33. 30 | | |
| 15 | 12*32. 22 | 30 | 22. 52. 5 | 16 | 20. 42. 53 E |
| 17 | 7* 1 29 | | | | |
| 19 | 1. 30. 35 | | | | |
| 20 | 19. 59. 44 | | | | |
| 22 | 14*28. 50 | | | | |
| 24 | 8*58. 0 | | | | |
| 26 | 3. 27. 8 | | | | |
| 27 | 21. 56. 19 | | | | |
| 29 | 16*25. 27 | | | | |
| 31 | 10*54. 37 | | | | |



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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | **MERCURY.** | | | | sup. ☌ 6d 1h | |
| 1 | 10. 25. 0 | 6. 54 S | 11. 6. 17 | 1. 59 S | 11. 4 S | 23. 46 |
| 7 | 11. 29. 8 | 5. 48 | 11. 17. 38 | 1. 33 | 6. 19 | 0. 6 |
| 13 | 0. 20. 15 | 3. 1 | 11. 29. 28 | 0. 46 | 0. 52 | 0. 26 |
| 19 | 1. 25. 28 | 1. 11 N | 0. 11. 12 | 0. 18 N | 4. 43 N | 0. 46 |
| 25 | 3. 3. 11 | 5. 10 | 0. 21. 42 | 1 3 1 | 9. 52 | 1. 1 |
| | **VENUS.** | | | | | |
| 1 | 0. 9. 39 | 3. 4 S | 11. 22. 54 | 1. 21 S | 4. 4 S | 0. 47 |
| 7 | 0. 19. 14 | 2. 47 | 0. 0. 22 | 1. 13 | 0. 59 | 0. 52 |
| 13 | 0. 28. 50 | 2. 26 | 0. 7. 50 | 1. 5 | 2. 7 N | 0. 57 |
| 19 | 1. 8. 25 | 2. 0 | 0. 15. 14 | 0. 54 | 5. 11 | 1. 2 |
| 25 | 1. 18. 2 | 1. 31 | 0. 22. 41 | 0. 41 | 8. 12 | 1. 8 |
| | **MARS.** | | | | | |
| 1 | 2. 17. 48 | 0. 55 N | 1. 13. 13 | 0. 49 N | 16. 37 N | 3. 53 |
| 7 | 2. 20. 49 | 1. 0 | 1. 17. 7 | 0. 52 | 17. 47 | 3. 47 |
| 13 | 2. 23. 47 | 1. 5 | 1. 21. 3 | 0. 55 | 18. 55 | 3. 40 |
| 19 | 2. 26. 45 | 1. 9 | 1. 24. 55 | 0. 57 | 19. 58 | 3. 34 |
| 25 | 2. 29. 40 | 1. 14 | 1. 28. 49 | 1. 0 | 20. 55 | 3. 28 |
| | **JUPITER.** | | | | ☍ 8d 8h | |
| 1 | 5. 17. 31 | 1. 14 N | 5. 19. 3 | 1. 31 N | 5. 44 N | 12. 31 |
| 7 | 5. 17. 59 | 1. 14 | 5. 18. 15 | 1. 30 | 6. 1 | 12. 6 |
| 13 | 5. 18. 26 | 1. 14 | 5. 17. 30 | 1. 30 | 6. 18 | 11. 41 |
| 19 | 5. 18. 53 | 1. 15 | 5. 16. 43 | 1. 31 | 6. 39 | 11. 16 |
| 25 | 5. 19. 21 | 1. 15 | 5. 15. 59 | 1. 31 | 6. 56 | 10. 52 |
| | **SATURN.** | | | | □ 3d 6h | |
| 1 | 2. 19. 13 | 1. 20 S | 2. 12. 53 | 1. 21 S | 21. 2 N | 5. 58 |
| 7 | 2. 19. 26 | 1. 20 | 2. 13. 7 | 1. 20 | 21. 5 | 5. 36 |
| 13 | 2. 19. 40 | 1. 19 | 2. 13. 24 | 1. 18 | 21. 8 | 5. 16 |
| 19 | 2. 19. 53 | 1. 19 | 2. 13. 45 | 1. 17 | 21. 12 | 4. 55 |
| 25 | 2. 20. 7 | 1. 18 | 2. 14. 9 | 1. 15 | 21. 16 | 4. 35 |

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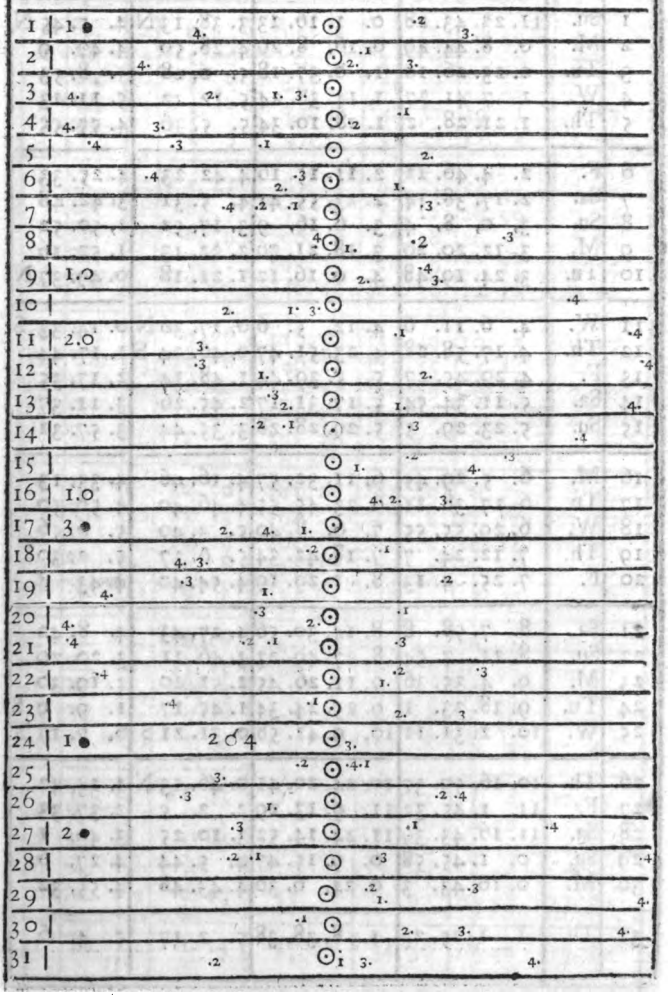
## Configurations of the SATELLITES of JUPITER at 8 o'th' Clock in the Evening.

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# MARCH 1767.

| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Su. | 11. 23. 43. 28 | 0. 1. 16. 13 | 3. 38. 13 N | 4. 5. 45 N |
| 2 | M. | 0. 8. 44. 49 | 0. 16. 8. 26 | 4. 28. 50 | 4. 47. 9 |
| 3 | Tu. | 0. 23. 26. 10 | 1. 0. 37. 18 | 5. 0. 28 | 5. 8. 53 |
| 4 | W. | 1. 7. 41. 27 | 1. 14. 38. 24 | 5. 12. 22 | 5. 11. 13 |
| 5 | Th. | 1. 21. 28. 2 | 1. 28. 10. 34 | 5. 5. 36 | 4. 55. 55 |
| 6 | F. | 2. 4. 46. 12 | 2. 11. 15. 16 | 4. 42 23 | 4. 25. 33 |
| 7 | Sa. | 2. 17. 38. 14 | 2. 23. 55. 41 | 4. 5. 31 | 3. 42. 48 |
| 8 | Su. | 3. 0. 8. 4 | 3. 6. 16. 9 | 3. 17. 52 | 2. 50. 52 |
| 9 | M. | 3. 12. 20. 20 | 3. 18. 21. 26 | 2. 22. 13 | 1. 52. 16 |
| 10 | Tu. | 3. 24. 19. 48 | 4. 0. 16. 12 | 1. 21. 18 | 0. 49. 37 N |
| 11 | W. | 4. 6. 11. 6 | 4. 12. 5. 6 | 0. 17. 36 N | 0. 14. 33 S |
| 12 | Th. | 4. 17. 58. 28 | 4. 23. 51. 47 | 0. 46. 24 S | 1. 17. 44 |
| 13 | F. | 4. 29. 45. 27 | 5. 5. 39. 44 | 1. 48. 14 | 2. 17. 35 |
| 14 | Sa. | 5. 11. 34. 54 | 5. 17. 31. 17 | 2. 45. 26 | 3. 11. 37 |
| 15 | Su. | 5. 23. 29. 5 | 5. 29. 28. 28 | 3. 35. 44 | 3. 57. 31 |
| 16 | M. | 6. 5. 29. 45 | 6. 11. 32. 57 | 4. 16. 46 | 4. 33. 13 |
| 17 | Tu. | 6. 17. 38. 21 | 6. 23. 45. 55 | 4. 46. 40 | 4. 56. 50 |
| 18 | W. | 6. 29. 55. 55 | 7. 6. 8. 40 | 5. 3. 40 | 5. 6. 56 |
| 19 | Th. | 7. 12. 24. 7 | 7. 18. 42. 34 | 5. 6. 37 | 5. 2. 30 |
| 20 | F. | 7. 25. 4. 13 | 8. 1. 29. 19 | 4. 54. 40 | 4. 43. 4 |
| 21 | Sa. | 8. 7. 58. 8 | 8. 14. 30. 56 | 4. 27. 43 | 4. 8. 42 |
| 22 | Su. | 8. 21. 7. 54 | 8. 27. 49. 23 | 3. 46. 11 | 3. 20. 20 |
| 23 | M. | 9. 4. 35. 36 | 9. 11. 26. 45 | 2. 51. 20 | 2. 19. 30 |
| 24 | Tu. | 9. 18. 23. 1 | 9. 25. 24. 34 | 1. 45. 17 | 1. 9. 9 S |
| 25 | W. | 10. 2. 31. 11 | 10. 9. 42. 58 | 0. 31. 21 S | 0. 7. 17 N |
| 26 | Th. | 10. 16. 59. 35 | 10. 24. 20. 41 | 0. 46. 13 N | 1. 24. 42 |
| 27 | F. | 11. 1. 45. 32 | 11. 9. 13. 29 | 2. 2. 5 | 2. 37. 33 |
| 28 | Sa. | 11. 16. 43. 39 | 11. 24. 14. 52 | 3. 10. 25 | 3. 40. 1 |
| 29 | Su. | 0. 1. 45. 58 | 0. 9. 15. 47 | 4. 5. 44 | 4. 27. 6 |
| 30 | M. | 0. 16. 43. 3 | 0. 24. 6. 36 | 4. 43. 48 | 4. 55. 32 |
| 31 | Tu. | 1. 1. 25. 23 | 1. 8. 38. 38 | 5. 2. 17 | 5. 4. 6 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Paſſage over Merid. | ☽'s Right Aſcen. at Noon. | ☽'s Right Aſc. at Midn. | ☽'s Declinat. at Noon. | ☽'s Declin. at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h ′ | ° ′ | ° ′ | ° ′ | ° ′ |
| 1 | Su. | 2 | 0. 43 | 352. 48 | 359. 32 | 0. 50 N | 4. 16 N |
| 2 | M. | 3 | 1. 36 | 6. 14 | 13. 0 | 7. 36 | 10. 47 |
| 3 | Tu. | 4 | 2. 28 | 19. 47 | 26. 38 | 13. 45 | 16. 31 |
| 4 | W. | 5 | 3. 21 | 33. 32 | 40. 31 | 19. 1 | 21. 13 |
| 5 | Th. | 6 | 4. 15 | 47. 35 | 54. 43 | 23. 4 | 24. 34 |
| 6 | F. | 7 | 5. 11 | 61. 52 | 69. 1 | 25. 43 | 26. 32 |
| 7 | Sa. | 8 | 6. 7 | 76. 8 | 83. 12 | 26. 59 | 27. 3 |
| 8 | Su. | 9 | 6. 59 | 90. 9 | 96. 58 | 26. 46 | 26. 10 |
| 9 | M. | 10 | 7. 52 | 103. 39 | 110. 9 | 25. 15 | 24. 4 |
| 10 | Tu. | 11 | 8. 40 | 116. 29 | 122. 39 | 22. 36 | 20. 56 |
| 11 | W. | 12 | 9. 26 | 128. 39 | 134. 29 | 19. 3 | 16. 59 |
| 12 | Th. | 13 | 10. 8 | 140. 11 | 145. 45 | 14. 44 | 12. 22 |
| 13 | F. | 14 | 10. 50 | 151. 13 | 156. 38 | 9. 53 | 7. 19 |
| 14 | Sa. | 15 | 11. 29 | 161. 58 | 167. 16 | 4. 41 N | 2. 0 N |
| 15 | Su. | 16 | 12. 9 | 172. 35 | 177. 57 | 0. 43 S | 3. 26 S |
| 16 | M. | 17 | 12. 50 | 183. 20 | 188. 49 | 6. 7 | 8. 46 |
| 17 | Tu. | 18 | 13. 33 | 194. 23 | 200. 6 | 11. 21 | 13. 49 |
| 18 | W. | 19 | 14. 19 | 205. 59 | 212. 3 | 16. 11 | 18. 25 |
| 19 | Th. | 20 | 15. 8 | 218. 17 | 224. 45 | 20. 27 | 22. 16 |
| 20 | F. | 21 | 16. 1 | 231. 25 | 238. 18 | 23. 49 | 25. 6 |
| 21 | Sa. | 22 | 16. 58 | 245. 24 | 252. 41 | 26. 4 | 26. 41 |
| 22 | Su. | 23 | 17. 55 | 260. 4 | 267. 33 | 26. 56 | 26. 47 |
| 23 | M. | 24 | 18. 53 | 275. 7 | 282. 39 | 26. 14 | 25. 18 |
| 24 | Tu. | 25 | 19. 52 | 290. 10 | 297. 35 | 23. 56 | 22. 12 |
| 25 | W. | 26 | 20. 49 | 304. 55 | 312. 8 | 20. 7 | 17. 43 |
| 26 | Th. | 27 | 21. 43 | 319. 13 | 326. 11 | 15. 2 | 12. 5 |
| 27 | F. | 28 | 22. 35 | 333. 2 | 339. 50 | 8. 58 | 5. 42 S |
| 28 | Sa. | 29 | 23. 26 | 346. 34 | 353. 16 | 2. 19 S | 1. 5 N |
| 29 | Su. | 30 | ♂ | 0. 0 | 6. 44 | 4. 27 N | 7. 46 |
| 30 | M. | 1 | 0. 19 | 13. 33 | 20. 27 | 10. 57 | 13. 56 |
| 31 | Tu. | 2 | 1. 13 | 27. 26 | 34. 30 | 16. 42 | 19. 10 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Log. at Noon. | Logistic Log. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Su. | 16. 41 | 16. 37 | 61. 13 | 60. 58 | 9913 | 9931 |
| 2 | M. | 16. 32 | 16. 26 | 60. 40 | 60. 18 | 9952 | 9978 |
| 3 | Tu. | 16. 19 | 16. 12 | 59. 53 | 59. 26 | 0008 | 0041 |
| 4 | W. | 16. 4 | 15. 56 | 58. 59 | 58. 30 | 0074 | 0110 |
| 5 | Th. | 15. 48 | 15. 41 | 58. 0 | 57. 32 | 0147 | 0182 |
| 6 | F. | 15. 33 | 15. 27 | 57. 5 | 56. 41 | 0216 | 0247 |
| 7 | Sa. | 15. 20 | 15. 13 | 56. 15 | 55. 52 | 0280 | 0310 |
| 8 | Su. | 15. 8 | 15. 3 | 55. 32 | 55. 14 | 0336 | 0359 |
| 9 | M. | 14. 59 | 14. 54 | 54. 58 | 54. 43 | 0381 | 0400 |
| 10 | Tu. | 14. 52 | 14. 49 | 54. 33 | 54. 23 | 0414 | 0427 |
| 11 | W. | 14. 47 | 14. 46 | 54. 17 | 54. 13 | 0435 | 0440 |
| 12 | Th. | 14. 45 | 14. 44 | 54. 8 | 54. 5 | 0447 | 0451 |
| 13 | F. | 14. 45 | 14. 46 | 54. 6 | 54. 8 | 0450 | 0447 |
| 14 | Sa. | 14. 46 | 14. 47 | 54. 11 | 54. 15 | 0443 | 0438 |
| 15 | Su. | 14. 48 | 14. 51 | 54. 20 | 54. 27 | 0431 | 0422 |
| 16 | M. | 14. 52 | 14. 55 | 54. 34 | 54. 43 | 0412 | 0400 |
| 17 | Tu. | 14. 57 | 15. 1 | 54. 53 | 55. 5 | 0387 | 0371 |
| 18 | W. | 15. 4 | 15. 8 | 55. 17 | 55. 31 | 0356 | 0337 |
| 19 | Th. | 15. 12 | 15. 16 | 55. 45 | 56. 1 | 0319 | 0299 |
| 20 | F. | 15. 20 | 15. 25 | 56. 18 | 56. 36 | 0276 | 0253 |
| 21 | Sa. | 15. 31 | 15. 36 | 56. 56 | 57. 16 | 0228 | 0202 |
| 22 | Su. | 15. 42 | 15. 48 | 57. 38 | 58. 0 | 0175 | 0147 |
| 23 | M. | 15. 54 | 16. 0 | 58. 22 | 58. 45 | 0120 | 0091 |
| 24 | Tu. | 16. 7 | 16. 13 | 59. 8 | 59. 29 | 0063 | 0038 |
| 25 | W. | 16. 18 | 16. 23 | 59. 50 | 60. 9 | 0012 | 9989 |
| 26 | Th. | 16. 28 | 16. 32 | 60. 27 | 60. 41 | 9968 | 9951 |
| 27 | F. | 16. 35 | 16. 37 | 60. 52 | 60. 59 | 9938 | 9929 |
| 28 | Sa. | 16. 38 | 16. 38 | 61. 3 | 61. 3 | 9925 | 9925 |
| 29 | Su. | 16. 36 | 16. 33 | 60. 57 | 60. 46 | 9932 | 9945 |
| 30 | M. | 16. 30 | 16. 25 | 60. 33 | 60. 15 | 9960 | 9982 |
| 31 | Tu. | 16. 20 | 16. 13 | 59. 55 | 59. 31 | 0006 | 0035 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 2 | Aldebaran. | 58. 34. 1 | 56. 45. 33 | 54. 57. 16 | 53. 9. 27 |
| 3 | | 44. 18. 1 | 42. 33. 42 | 40. 49. 56 | 39. 6. 52 |
| 4 | | 30. 43. 3 | 29. 5. 50 | 27. 29. 13 | 25. 53. 53 |
| 5 | Pollux. | 58. 14. 1 | 56. 33. 41 | 54. 53. 37 | 53. 14. 1 |
| 6 | | 45. 2. 5 | 43. 26. 6 | 41. 49. 40 | 40. 13. 40 |
| 7 | Regulus. | 68. 59. 1 | 67. 24. 37 | 65. 50. 13 | 64. 16. 7 |
| 8 | | 56. 30. 7 | 54. 57. 41 | 53. 25. 21 | 51. 53. 34 |
| 9 | | 44. 17. 24 | 42. 46. 44 | 41. 16. 15 | 39. 45. 57 |
| 10 | | 32. 16. 54 | 30. 47. 30 | 29. 18. 14 | 27. 49. 5 |
| 11 | | 20. 25. 8 | 18. 56. 40 | 17. 28. 21 | 16. 0. 9 |
| 12 | Spica ♍ | 62. 37. 10 | 61. 8. 40 | 59. 40. 9 | 58. 11. 39 |
| 13 | | 50. 48. 57 | 49. 20. 23 | 47. 51. 46 | 46. 23. 9 |
| 14 | | 38. 59. 33 | 37. 30. 42 | 36. 1. 48 | 34. 32. 53 |
| 15 | | 27. 7. 45 | 25. 38. 39 | 24. 9. 31 | 22. 40. 22 |
| 16 | | 15. 14. 58 | 13. 46. 25 | 12. 18. 12 | 10. 50. 21 |
| 17 | Antares. | 48. 42. 33 | 47. 11. 7 | 45. 39. 35 | 44. 7. 55 |
| 18 | | 36. 27. 30 | 34. 54. 55 | 33. 22. 11 | 31. 49. 16 |
| 19 | | 24. 2. 15 | 22. 28. 18 | 20. 54. 8 | 19. 19. 49 |
| 20 | α Aquilæ | 69. 42. 28 | 68. 21. 45 | 67. 1. 11 | 65. 40. 45 |
| 21 | β Capricorni. | 53. 32. 54 | 51. 55. 53 | 50. 18. 38 | 48. 41. 12 |
| 22 | | 40. 30. 25 | 38. 51. 32 | 37. 12. 24 | 35. 33. 5 |
| 23 | | 27. 13. 41 | | | |
| 21 | The Sun. | 112. 37. 5 | 111. 7. 10 | 109. 36. 59 | 108. 6. 29 |
| 22 | | 100. 29. 44 | 98. 57. 29 | 97. 24. 55 | 95. 52. 3 |
| 23 | | 88. 2. 57 | 86. 28. 9 | 84. 53. 1 | 83. 17. 33 |
| 24 | | 75. 15. 10 | 73. 37. 40 | 71. 59. 48 | 70. 21. 38 |
| 25 | | 62. 5. 57 | 60. 25. 51 | 58. 45. 27 | 57. 4. 45 |
| 26 | | 48. 37. 5 | 46. 54. 44 | 45. 12. 11 | 43. 29. 26 |
| 31 | Aldebaran | 36. 36. 36 | 34. 53. 1 | 33. 10. 9 | 31. 28. 8 |



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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Aldebaran. | 65. 53. 13 | 64. 2. 55 | 62. 12. 58 | 60. 23. 24 |
| 2 | | 51. 22. 2 | 49. 35. 12 | 47. 48. 56 | 46. 3. 16 |
| 3 | | 37. 24. 32 | 35. 42. 59 | 34. 2. 16 | 32. 22. 27 |
| 4 | Pollux. | 64. 59. 48 | 63. 17. 48 | 61. 36. 12 | 59. 54. 59 |
| 5 | | 51. 34. 51 | 49. 56. 11 | 48. 18. 0 | 46. 40. 15 |
| 6 | | 38. 38. 5 | 37. 2. 54 | 35. 28. 8 | 33. 53. 47 |
| 7 | Regulus. | 62. 42. 20 | 61. 18. 52 | 59. 35. 40 | 58. 2. 45 |
| 8 | | 50. 21. 53 | 48. 50. 26 | 47. 19. 13 | 45. 48. 11 |
| 9 | | 38. 15. 49 | 36. 45. 52 | 35. 16. 3 | 33. 46. 25 |
| 10 | | 26. 20. 4 | 24. 51. 9 | 23. 22. 22 | 21. 53. 41 |
| 11 | | 14. 32. 8 | 13. 4. 20 | 11. 36. 49 | 10. 9. 39 |
| 12 | Spica ♍ | 56. 43. 7 | 55. 14. 36 | 53. 46. 4 | 52. 17. 31 |
| 13 | | 44. 54. 29 | 43. 25. 48 | 41. 57. 5 | 40. 28. 20 |
| 14 | | 33. 3. 56 | 31. 34. 56 | 30. 5. 54 | 28. 36. 52 |
| 15 | | 21. 11. 10 | 19. 41. 59 | 18. 12. 50 | 16. 43. 48 |
| 16 | Antares. | 54. 46. 59 | 53. 16. 3 | 51. 45. 1 | 50. 13. 50 |
| 17 | | 42. 36. 6 | 41. 4. 10 | 39. 32. 6 | 37. 59. 52 |
| 18 | | 30. 16. 12 | 28. 42. 59 | 27. 9. 34 | 25. 36. 0 |
| 19 | α Aquilæ. | 75. 5. 53 | 73. 45. 0 | 72. 24. 8 | 71. 3. 16 |
| 20 | | 64. 20. 29 | 63. 0. 25 | 61. 40. 34 | 60. 20. 59 |
| 21 | β Capricorni. | 47. 3. 31 | 45. 25. 36 | 43. 47. 26 | 42. 9. 3 |
| 22 | | 33. 53. 32 | 32. 13. 49 | 30. 33. 56 | 28. 53. 53 |
| 20 | The Sun. | 118. 34. 10 | 117. 5. 18 | 115. 36. 10 | 114. 6. 46 |
| 21 | | 106. 35. 43 | 105. 4. 40 | 103. 33. 19 | 102. 1. 41 |
| 22 | | 94. 18. 52 | 92. 45. 22 | 91. 11. 33 | 89. 37. 25 |
| 23 | | 81. 41. 45 | 80. 5. 37 | 78. 29. 8 | 76. 52. 20 |
| 24 | | 68. 43. 7 | 67. 4. 18 | 65. 25. 10 | 63. 45. 43 |
| 25 | | 55. 23. 45 | 53. 42. 28 | 52. 0. 56 | 50. 19. 8 |
| 26 | | 41. 46. 29 | 40. 3. 22 | 38. 20. 7 | 36. 36. 44 |
| 31 | Aldebaran | 29. 47. 6 | 28. 7. 12 | 26. 28. 32 | 24. 51. 12 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 3 | The Sun. | 40. 56. 54 | 42. 37. 12 | 44. 17. 4 | 45. 56. 30 |
| 4 | | 54. 7. 14 | 55. 44. 3 | 57. 20. 26 | 58. 56. 22 |
| 5 | | 66. 49. 20 | 68. 22. 37 | 69. 55. 29 | 71. 27. 56 |
| 6 | | 79. 3. 57 | 80. 33. 57 | 82. 3. 35 | 83. 32. 50 |
| 7 | | 90. 53. 41 | 92. 20. 51 | 93. 47. 43 | 95. 14. 15 |
| 8 | | 102. 22. 23 | 103. 47. 25 | 105. 12. 3 | 106. 36. 26 |
| 9 | | 113. 34. 50 | 114. 57. 58 | 116. 20. 56 | 117. 43. 44 |
| 7 | α Arietis. | 43. 16. 5 | 44. 50. 10 | 46. 24. 0 | 47. 57. 33 |
| 8 | Aldebaran. | 25. 9. 1 | 26. 33. 51 | 27. 59. 4 | 29. 24. 39 |
| 9 | | 36. 36. 33 | 38. 3. 27 | 39. 30. 25 | 40. 57. 28 |
| 10 | | 48. 12. 58 | 49. 40. 6 | 51. 7. 13 | 52. 34. 21 |
| 11 | | 59. 49. 55 | 61. 17. 2 | 62. 44. 9 | 64. 11. 16 |
| 12 | Pollux. | 28. 52. 41 | 30. 20. 0 | 31. 47. 25 | 33. 14. 56 |
| 13 | | 40. 33. 53 | 42. 1. 53 | 43. 29. 58 | 44. 58. 8 |
| 14 | Regulus. | 15. 18. 50 | 16. 47. 18 | 18. 15. 54 | 19. 44. 37 |
| 15 | | 27. 10. 9 | 28. 39. 36 | 30. 9. 8 | 31. 38. 47 |
| 16 | | 39. 8. 42 | 40. 39. 3 | 42. 9. 30 | 43. 40. 5 |
| 17 | | 51. 14. 48 | 52. 46. 8 | 54. 17. 36 | 55. 49. 11 |
| 18 | | 63. 29. 12 | 65. 1. 42 | 66. 34. 23 | 68. 7. 13 |
| 19 | Spica ♍ | 21. 58. 7 | 23. 31. 17 | 25. 4. 44 | 26. 38. 29 |
| 20 | | 34. 31. 3 | 36. 6. 18 | 37. 41. 51 | 39. 17. 37 |
| 21 | | 47. 20. 34 | 48. 57. 59 | 50. 35. 40 | 52. 13. 40 |
| 22 | | 60. 27. 51 | 62. 7. 37 | 63. 47. 42 | 65. 28. 6 |
| 23 | Antares. | 28. 3. 45 | 29. 46. 14 | 31. 29. 2 | 33. 12. 11 |
| 24 | | 41. 53. 7 | 43. 38. 21 | 45. 23. 56 | 47. 9. 50 |
| 25 | | 56. 4. 18 | 57. 52. 12 | 59. 40. 25 | 61. 28. 57 |
| 26 | β Capricorni. | 16. 37. 26 | 18. 22. 45 | 20. 8. 57 | 21. 55. 58 |
| 27 | | 31. 0. 41 | 32. 50. 58 | 34. 41. 35 | 36. 32. 30 |
| 28 | α Aquilæ. | 52. 37. 35 | 54. 5. 44 | 55. 34. 56 | 57. 5. 6 |



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Diſtances of ☽'s Center from ☉, and from Stars weſt of her

| Days | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 3 | | 47. 35. 32 | 49. 14. 7 | 50. 52. 15 | 52. 29. 58 |
| 4 | | 60. 31. 52 | 62. 6. 53 | 63. 41. 28 | 65. 15. 37 |
| 5 | | 72. 59. 57 | 74. 31. 33 | 76. 2. 45 | 77. 33. 33 |
| 6 | The Sun. | 85. 1. 42 | 86. 30. 12 | 87. 58. 22 | 89. 26. 11 |
| 7 | | 96. 40. 30 | 98. 6. 26 | 99. 32. 5 | 100. 57. 27 |
| 8 | | 108. 0. 35 | 109. 24. 27 | 110. 48. 7 | 112. 11. 34 |
| 9 | | 119. 6. 21 | | | |
| 6 | α Arietis. | 36. 56. 52 | 38. 32. 5 | 40. 7. 2 | 41. 41. 42 |
| 7 | | 49. 30. 50 | 51. 3. 51 | 52. 36. 36 | 54. 9. 5 |
| 8 | | 30. 50. 33 | 32. 16. 45 | 33. 43. 9 | 35. 9. 45 |
| 9 | Aldeba- | 42. 24. 35 | 43. 51. 40 | 45. 18. 45 | 46. 45. 51 |
| 10 | ran. | 54. 1. 29 | 55. 28. 35 | 56. 55. 42 | 58. 22. 48 |
| 11 | | 65. 38. 23 | 67. 5. 29 | 68. 32. 35 | 69. 59. 42 |
| 12 | Pollux. | 34. 42. 35 | 36. 10. 18 | 37. 38. 5 | 39. 5. 57 |
| 13 | | 46. 26. 22 | 47. 54. 39 | 49. 23. 0 | 50. 51. 26 |
| 14 | | 21. 13. 28 | 22. 42. 27 | 24. 11. 34 | 25. 40. 48 |
| 15 | Regulus. | 33. 8. 32 | 34. 38. 25 | 36. 8. 24 | 37. 38. 30 |
| 16 | | 45. 10. 46 | 46. 41. 36 | 48. 12. 32 | 49. 43. 36 |
| 17 | | 57. 20. 54 | 58. 52. 45 | 60. 24. 45 | 61. 56. 54 |
| 18 | | 15. 48. 39 | 17. 20. 33 | 18. 52. 46 | 20. 25. 17 |
| 19 | | 28. 12. 30 | 29. 46. 44 | 31. 21. 15 | 32. 56. 1 |
| 20 | Spica ♍ | 40. 53. 41 | 42. 30. 0 | 44. 6. 34 | 45. 43. 27 |
| 21 | | 53. 51. 55 | 55. 30. 27 | 57. 9. 17 | 58. 48. 25 |
| 22 | | 67. 8. 48 | 68. 49. 50 | 70. 31. 11 | 72. 12. 52 |
| 23 | | 34. 55. 40 | 36. 39. 31 | 38. 23. 42 | 40. 8. 14 |
| 24 | Antares. | 48. 56. 5 | 50. 42. 38 | 52. 29. 31 | 54. 16. 45 |
| 25 | | 63. 17. 49 | 65. 6. 58 | 66. 56. 24 | 68. 46. 7 |
| 26 | β Capricorni. | 23. 43. 43 | 25. 32. 9 | 27. 21. 11 | 29. 10. 44 |
| 27 | α Aquilæ. | 46. 57. 42 | 48. 20. 33 | 49. 44. 53 | 51. 10. 35 |
| 28 | | 58. 36. 8 | 60. 7. 55 | 61. 40. 21 | 63. 13. 19 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | W. | |
| 2 | Th. | |
| 3 | F. | Richard, Bp. of Chich. |
| 4 | Sa. | St. Ambroſe. |
| 5 | *Su.* | *5th Sunday in Lent.* |
| 6 | M. | |
| 7 | Tu. | |
| 8 | W. | |
| 9 | Th. | |
| 10 | F. | Cambridge Term ends. |
| 11 | Sa. | Oxford Term ends. |
| 12 | *Su.* | *6th Sunday in Lent, Palm* [*Sunday.* |
| 13 | M. | |
| 14 | Tu. | |
| 15 | W. | |
| 16 | Th. | |
| 17 | F. | Good-Friday. |
| 18 | Sa. | |
| 19 | *Su.* | *Eaſter-Day.* Alph. |
| 20 | M. | Eaſter-Monday. |
| 21 | Tu. | Eaſter-Tueſday. |
| 22 | W. | |
| 23 | Th. | St. George. |
| 24 | F. | |
| 25 | Sa. | St. Mark. |
| 26 | *Su.* | *1ſt Sunday after Eaſter,* |
| 27 | M. | [*Low Sunday.* |
| 28 | Tu. | |
| 29 | W. | Oxford and Cambridge |
| 30 | Th. | [Terms begin. |

## Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Firſt Quarter — | 5. | 14. | 41 |
| Full Moon — | 13. | 19. | 1 |
| Laſt Quarter — | 21. | 4. | 28 |
| New Moon — | 27. | 20. | 55 |

## Other Phenomena.

D.

1. ☾ ☌ Pleiadum $18^h$ 56′.
4. ☾ ☌ ♊ $20^h$ 24′.
7. ☾ ☌ ♋ $5^h$ 27′.
11. ☾ ☌ ♌ $3^h$ 24′.
16. ☾ ☍ ♏ Immerſion at $13^h$ 17′½ Emerſion at $14^h$ 27′.
☾ ☌ ♅ $23^h$ 22′.
17. ☾ ☌ ♏ $2^h$ 57′.
18. ☾ ſequens θ Ophiuchi $1^h$ 3′.
19. ☾ ☌ ♐ $3^h$ 0′.
☾ ☌ ♇ $13^h$ 45′.
☉ enters ♉ at $20^h$ 56′.
23. ☾ ☌ ♒ $5^h$ 11′.
29. ☾ ☌ Pleiadum $5^h$ 6′.

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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declination North. | Equat. of Time Add. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | W. | 0. 11. 31. 31 | 0. 42. 23 | 4. 33. 52 | 3. 59 | 19 |
| 2 | Th. | 0. 12. 30. 35 | 0. 46. 1 | 4. 56. 57 | 3. 40 | 18 |
| 3 | F. | 0. 13. 29. 37 | 0. 49. 39 | 5. 19. 57 | 3. 22 | 18 |
| 4 | Sa. | 0. 14. 28. 36 | 0. 53. 18 | 5. 42. 51 | 3. 4 | 18 |
| 5 | *Su.* | 0. 15. 27. 33 | 0. 56. 56 | 6. 5. 39 | 2. 46 | 18 |
| 6 | M. | 0. 16. 26. 28 | 1. 0. 34 | 6. 28. 20 | 2. 28 | 18 |
| 7 | Tu. | 0. 17. 25. 20 | 1. 4. 14 | 6. 50. 56 | 2. 10 | 17 |
| 8 | W. | 0. 18. 24. 10 | 1. 7. 53 | 7. 13. 24 | 1. 53 | 17 |
| 9 | Th. | 0. 19. 22. 58 | 1. 11. 32 | 7. 35. 45 | 1. 36 | 17 |
| 10 | F. | 0. 20. 21. 43 | 1. 15. 12 | 7. 57. 58 | 1. 19 | 17 |
| 11 | Sa. | 0. 21. 20. 26 | 1. 18. 52 | 8. 20. 2 | 1. 2 | 16 |
| 12 | *Su.* | 0. 22. 19. 7 | 1. 22. 32 | 8. 41. 59 | 0. 46 | 16 |
| 13 | M. | 0. 23. 17. 46 | 1. 26. 12 | 9. 3. 46 | 0. 30 | 15 |
| 14 | Tu. | 0. 24. 16. 23 | 1. 29. 53 | 9. 25. 25 | 0. 15 | 16 |
| 15 | W. | 0. 25. 14. 58 | 1. 33. 34 | 9. 46. 54 | Sub. 1 | 14 |
| 16 | Th. | 0. 26. 13. 31 | 1. 37. 16 | 10. 8. 14 | 0. 15 | 15 |
| 17 | F. | 0. 27. 12. 3 | 1. 40. 58 | 10. 29. 24 | 0. 30 | 14 |
| 18 | Sa. | 0. 28. 10. 32 | 1. 44. 40 | 10. 50. 23 | 0. 44 | 14 |
| 19 | *Su.* | 0. 29. 9. 1 | 1. 48. 23 | 11. 11. 12 | 0. 58 | 14 |
| 20 | M. | 1. 0. 7. 28 | 1. 52. 6 | 11. 31. 51 | 1. 12 | 12 |
| 21 | Tu. | 1. 1. 5. 53 | 1. 55. 49 | 11. 52. 18 | 1. 24 | 13 |
| 22 | W. | 1. 2. 4. 17 | 1. 59. 33 | 12. 12. 33 | 1. 37 | 13 |
| 23 | Th. | 1. 3. 2. 39 | 2. 3. 18 | 12. 32. 37 | 1. 50 | 11 |
| 24 | F. | 1. 4. 1. 0 | 2. 7. 3 | 12. 52. 29 | 2. 1 | 12 |
| 25 | Sa. | 1. 4. 59. 19 | 2. 10. 48 | 13. 12. 7 | 2. 13 | 11 |
| 26 | *Su.* | 1. 5. 57. 37 | 2. 14. 34 | 13. 31. 34 | 2. 24 | 9 |
| 27 | M. | 1. 6. 55. 53 | 2. 18. 21 | 13. 50. 46 | 2. 33 | 9 |
| 28 | Tu. | 1. 7. 54. 8 | 2. 22. 7 | 14. 9. 46 | 2. 42 | 9 |
| 29 | W. | 1. 8. 52. 20 | 2. 25. 55 | 14. 28. 31 | 2. 51 | 9 |
| 30 | Th. | 1. 9. 50. 31 | 2. 29. 43 | 14. 47. 2 | 3. 0 | |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | s ° ′ |
| 1 | 16. 2,3 | 1. 4,3 | 2. 27,6 | 0. 000215 | 10. 6. 42 |
| 7 | 16. 0,6 | 1. 4,5 | 2. 27,1 | 0. 000944 | 10. 6. 23 |
| 13 | 15. 59,1 | 1. 4,7 | 2. 26,6 | 0. 001667 | 10. 6. 4 |
| 19 | 15. 57,5 | 1. 5,1 | 2. 26,1 | 0. 002392 | 10. 5. 45 |
| 25 | 15. 56,0 | 1. 5,5 | 2. 25,6 | 0. 003102 | 10. 5. 26 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Emersions. | | II. Satellite. Emersions. | | III. Satellite. | |
|---|---|---|---|---|---|
| Days | h ′ ″ | Days | h ′ ″ | Days | h ′ ″ |
| 2 | 5. 23. 49 | 3 | 12*10. 43 | 7 | 22. 12. 10 E |
| 3 | 23. 52. 57 | 7 | 1. 29. 24 | 15 | 2. 12. 25 E |
| 5 | 18. 22. 11 | 10 | 14*48. 9 | 22 | 6. 12. 28 E |
| 7 | 12*51. 16 | 14 | 4. 6. 50 | 29 | 7* 7. 40 I |
| 9 | 7*20. 25 | 17 | 17. 25. 28 | 29 | 10*12. 8 E |
| 11 | 1. 49. 33 | 21 | 6. 44. 12 | | |
| 12 | 20. 18. 43 | 24 | 20. 2. 57 | | |
| 14 | 14*47. 48 | 28 | 9*21. 30 | | |
| 16 | 9*16. 55 | | | | |
| 18 | 3. 45. 55 | | | | |
| 19 | 22. 15. 4 | | | | |
| 21 | 16. 44. 3 | | | | |
| 23 | 11*13. 6 | | | | |
| 25 | 5. 42. 8 | | | | |
| 27 | 0. 11. 6 | | | | |
| 28 | 18. 40. 0 | | | | |
| 30 | 13* 8. 59 | | | | |

| IV. Satellite. | |
|---|---|
| 2 | 11* 9. 31 I |
| 2 | 14*41. 51 E |
| 19 | 5. 14. 3 I |
| 19 | 8*40. 17 E |

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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | s ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | **MERCURY.** | | | | | inf. ☌ 19ᵈ 15ʰ |
| 1 | 4. 14. 3 | 6. 59 N | 1. 0. 27 | 2. 42 N | 14. 10 N | 1. 7 |
| 7 | 5. 13. 15 | 6. 12 | 1. 3. 54 | 3. 8 | 15. 47 | 0. 58 |
| 13 | 6. 7. 22 | 4. 21 | 1. 3. 27 | 2. 48 | 15. 19 | 0. 35 |
| 19 | 6. 27. 50 | 2. 9 | 1. 0. 9 | 1. 37 | 13. 3 | 0. 1 |
| 25 | 7. 16. 0 | 0. 2 S | 0. 26. 14 | 0. 2 S | 10. 7 | 23. 22 |
| | **VENUS.** | | | | | |
| 1 | 1. 29. 17 | 0. 54 S | 1. 1. 17 | 0. 25 S | 11. 32 N | 1. 14 |
| 7 | 2. 8. 56 | 0. 20 | 1. 8. 40 | 0. 8 | 14. 17 | 1. 21 |
| 13 | 2. 18. 37 | 0. 14 N | 1. 16. 1 | 0. 7 N | 16. 46 | 1. 28 |
| 19 | 2. 28. 18 | 0. 48 | 1. 23. 21 | 0. 23 | 19. 0 | 1. 35 |
| 25 | 3. 8. 1 | 1. 21 | 2. 0. 39 | 0. 39 | 20. 57 | 1. 43 |
| | **MARS.** | | | | | |
| 1 | 3. 3. 3 | 1. 18 N | 2. 3. 20 | 1. 2 N | 21. 51 N | 3. 22 |
| 7 | 3. 5. 56 | 1. 22 | 2. 7. 13 | 1. 4 | 22. 36 | 3. 17 |
| 13 | 3. 8. 47 | 1. 26 | 2. 11. 6 | 1. 6 | 23. 14 | 3. 11 |
| 19 | 3. 11. 37 | 1. 29 | 2. 14. 57 | 1. 7 | 23. 44 | 3. 6 |
| 25 | 3. 14. 25 | 1. 32 | 2. 18. 47 | 1. 8 | 24. 8 | 3. 0 |
| | **JUPITER.** | | | | | |
| 1 | 5. 19. 53 | 1. 15 N | 5. 15. 13 | 1. 30 N | 7. 14 N | 10. 24 |
| 7 | 5. 20. 20 | 1. 15 | 3. 14. 35 | 1. 29 | 7. 28 | 10. 0 |
| 13 | 5. 20. 48 | 1. 15 | 5. 14. 7 | 1. 28 | 7. 38 | 9. 36 |
| 19 | 5. 21. 15 | 1. 16 | 5. 13. 40 | 1. 28 | 7. 47 | 9. 12 |
| 25 | 5. 21. 42 | 1. 16 | 5. 13. 21 | 1. 27 | 7. 54 | 8. 48 |
| | **SATURN.** | | | | | |
| 1 | 2. 20. 22 | 1. 17 S | 2. 14. 42 | 1. 14 S | 21. 21 N | 4. 11 |
| 7 | 2. 20. 36 | 1. 17 | 2. 15. 11 | 1. 13 | 21. 25 | 3. 51 |
| 13 | 2. 20. 49 | 1. 16 | 2. 15. 45 | 1. 12 | 21. 31 | 3. 31 |
| 19 | 2. 21. 3 | 1. 16 | 2. 16. 21 | 1. 11 | 21. 35 | 3. 12 |
| 25 | 2. 21. 16 | 1. 15 | 2. 16. 59 | 1. 9 | 21. 41 | 2. 52 |

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## Configurations of the SATELLITES of JUPITER at 9 o'th' Clock in the Evening.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | | | | ⊙ | | |
| 2 | 4● | | | ⊙ | | |
| 3 | 2● | | 4 ☌ 3 | ⊙ | | |
| 4 | | | | ⊙ | | |
| 5 | | | | ⊙ | | |
| 6 | | | | ⊙ | | |
| 7 | | | | ⊙ | | |
| 8 | 1.0 | | | ⊙ | | |
| 9 | | | | ⊙ | | |
| 10 | | | | ⊙ | | |
| 11 | 3.0 | | | ⊙ | | |
| 12 | | | | ⊙ | | |
| 13 | | | | ⊙ | | |
| 14 | | | | ⊙ | | |
| 15 | 1.0 | | | ⊙ | | |
| 16 | | | | ⊙ | | |
| 17 | | | | ⊙ 2 ☌ 1 | | |
| 18 | | | | ⊙ | | |
| 19 | 2.0 | | | ⊙ | | |
| 20 | | | | ⊙ | | |
| 21 | | | | ⊙ | | |
| 22 | | | | ⊙ | | |
| 23 | | | | ⊙ | | 1● |
| 24 | | | | ⊙ | | |
| 25 | | | | ⊙ | | |
| 26 | | | | ⊙ | | |
| 27 | 4○ | | | ⊙ | | |
| 28 | 2● | | | ⊙ | | |
| 29 | | | | ⊙ | | |
| 30 | | | | ⊙ | | |



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# APRIL 1767.

| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | W. | 1. 15. 45. 35 | 1. 22. 45. 42 | 5. 1. 8 N | 4. 53. 41 N |
| 2 | Th. | 1. 29. 38. 44 | 2. 6. 24. 32 | 4. 42. 5 | 4. 26. 39 |
| 3 | F. | 2. 13. 3. 12 | 2. 19. 35. 2 | 4. 7. 50 | 3. 46. 8 |
| 4 | Sa. | 2. 26. 0. 21 | 3. 2. 19. 39 | 3. 21. 49 | 2. 55. 27 |
| 5 | Su. | 3. 8. 33. 23 | 3. 14. 42. 16 | 2. 27. 15 | 1. 57. 46 |
| 6 | M. | 3. 20. 46. 57 | 3. 26. 48. 5 | 1. 27. 14 | 0. 55. 58 N |
| 7 | Tu. | 4. 2. 46. 23 | 4. 8. 42. 28 | 0. 24. 29 N | 0. 7. 9 S |
| 8 | W. | 4. 14. 37. 6 | 4. 20. 30. 44 | 0. 38. 29 S | 1. 9. 26 |
| 9 | Th. | 4. 26. 24. 8 | 5. 2. 17. 50 | 1. 39. 27 | 2. 8. 26 |
| 10 | F. | 5. 8. 12. 13 | 5. 14. 7. 53 | 2. 36. 5 | 3. 2. 8 |
| 11 | Sa. | 5. 20. 5. 19 | 5. 26. 4. 35 | 3. 26. 9 | 3. 48. 5 |
| 12 | Su. | 6. 2. 6. 11 | 6. 8. 10. 17 | 4. 7. 35 | 4. 24. 19 |
| 13 | M. | 6. 14. 16. 58 | 6. 20. 26. 33 | 4. 38. 13 | 4. 48. 53 |
| 14 | Tu. | 6. 26. 38. 58 | 7. 2. 54. 14 | 4. 56. 16 | 5. 0. 6 |
| 15 | W. | 7. 9. 12. 28 | 7. 15. 33. 42 | 5. 0. 18 | 4. 56. 51 |
| 16 | Th. | 7. 21. 57. 48 | 7. 28. 24. 44 | 4. 49. 34 | 4. 38. 35 |
| 17 | F. | 8. 4. 54. 34 | 8. 11. 27. 17 | 4. 23. 51 | 4. 5. 35 |
| 18 | Sa. | 8. 18. 2. 54 | 8. 24. 41. 26 | 3. 43. 51 | 3. 18. 54 |
| 19 | Su. | 9. 1. 23. 2 | 9. 8. 7. 40 | 2. 51. 1 | 2. 20. 27 |
| 20 | M. | 9. 14. 55. 29 | 9. 21. 46. 36 | 1. 47. 44 | 1. 13. 5 |
| 21 | Tu. | 9. 28. 41. 8 | 10. 5. 39. 5 | 0. 37. 9 S | 0. 0. 16 S |
| 22 | W. | 10. 12. 40. 30 | 10. 19. 45. 26 | 0. 36. 47 N | 1. 13. 39 N |
| 23 | Th. | 10. 26. 53. 40 | 11. 4. 5. 9 | 1. 49. 38 | 2. 24. 3 |
| 24 | F. | 11. 11. 19. 21 | 11. 18. 35. 57 | 2. 56. 21 | 3. 25. 56 |
| 25 | Sa. | 11. 25. 54. 22 | 0. 3. 13. 56 | 3. 52. 19 | 4. 14. 49 |
| 26 | Su. | 0. 10. 33. 45 | 0. 17. 53. 2 | 4. 33. 11 | 4. 46. 57 |
| 27 | M. | 0. 25. 10. 39 | 1. 2. 25. 51 | 4. 55. 59 | 5. 0. 10 |
| 28 | Tu. | 1. 9. 37. 33 | 1. 16. 44. 56 | 4. 59. 33 | 4. 54. 17 |
| 29 | W. | 1. 23. 47. 30 | 2. 0. 44. 25 | 4. 44. 29 | 4. 30. 40 |
| 30 | Th. | 2. 7. 35. 18 | 2. 14. 20. 4 | 4. 13. 1 | 3. 52. 4 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Paſſage over Merid. | ☽'s Right Aſcen. at Noon. | ☽'s Right Aſc. at Midn. | ☽'s Declination at Noon. | ☽'s Declination at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h ′ | ° ′ | ° ′ | ° ′ | ° |
| 1 | W. | 3 | 2. 9 | 41. 43 | 49. 0 | 21. 23 N | 23. 12 N. |
| 2 | Th. | 4 | 3. 6 | 56. 20 | 63. 42 | 24. 41 | 25. 47 |
| 3 | F. | 5 | 4. 4 | 71. 3 | 78. 20 | 26. 29 | 26. 49 |
| 4 | Sa. | 6 | 4. 59 | 85. 32 | 92. 35 | 26. 47 | 26. 23 |
| 5 | *Su.* | 7 | 5. 53 | 99. 29 | 106. 12 | 25. 39 | 24. 37 |
| 6 | M. | 8 | 6. 42 | 112. 43 | 119. 2 | 23. 18 | 21. 44 |
| 7 | Tu. | 9 | 7. 30 | 125. 9 | 131. 7 | 19. 58 | 18. 0 |
| 8 | W. | 10 | 8. 13 | 136. 54 | 142. 32 | 15. 52 | 13. 34 |
| 9 | Th. | 11 | 8. 54 | 148. 4 | 153. 30 | 11. 10 | 8. 40 |
| 10 | F. | 12 | 9. 36 | 158. 52 | 164. 12 | 6. 5 | 3. 27 N. |
| 11 | Sa. | 13 | 10. 16 | 169. 32 | 174. 53 | 0. 47 N | 1. 55 S |
| 12 | *Su.* | 14 | 10. 56 | 180. 17 | 185. 45 | 4. 37 S | 7. 17 |
| 13 | M. | 15 | 11. 39 | 191. 19 | 197. 1 | 9. 55 | 12. 27 |
| 14 | Tu. | 16 | 12. 22 | 202. 52 | 208. 55 | 14. 53 | 17. 11 |
| 15 | W. | 17 | 13. 14 | 215. 8 | 221. 33 | 19. 19 | 21. 15 |
| 16 | Th. | 18 | 14. 6 | 228. 11 | 235. 2 | 22. 57 | 24. 22 |
| 17 | F. | 19 | 15. 2 | 242. 4 | 249. 17 | 25. 28 | 26. 14 |
| 18 | Sa. | 20 | 15. 59 | 256. 38 | 264. 4 | 26. 39 | 26. 41 |
| 19 | *Su.* | 21 | 16. 57 | 271. 32 | 279. 0 | 26. 19 | 25. 34 |
| 20 | M. | 22 | 17. 53 | 286. 25 | 293. 45 | 24. 25 | 22. 55 |
| 21 | Tu. | 23 | 18. 49 | 300. 57 | 308. 1 | 21. 3 | 18. 53 |
| 22 | W. | 24 | 19. 41 | 314. 57 | 321. 47 | 16. 26 | 13. 45 |
| 23 | Th. | 25 | 20. 32 | 328. 29 | 335. 6 | 10. 51 | 7. 48 |
| 24 | F. | 26 | 21. 22 | 341. 39 | 348. 11 | 4. 37 S | 1. 22 S |
| 25 | Sa. | 27 | 22. 13 | 354. 42 | 1. 16 | 1. 55 N | 5. 11 N |
| 26 | *Su.* | 28 | 23. 6 | 7. 55 | 14. 38 | 8. 22 | 11. 27 |
| 27 | M. | 29 | ☌ | 21. 29 | 28. 26 | 14. 20 | 17. 2 |
| 28 | Tu | 1 | 0. 0 | 35. 32 | 42. 46 | 19. 27 | 21. 33 |
| 29 | W. | 2 | 0. 57 | 50. 7 | 57. 33 | 23. 20 | 24. 45 |
| 30 | Th. | 3 | 1. 55 | 65. 1 | 72. 29 | 25. 46 | 26. 23 |



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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Log. at Noon. | Logistic Log. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | W. | 16. 6 | 15. 59 | 59. 6 | 58. 39 | 0066 | 0099 |
| 2 | Th. | 15. 51 | 15. 43 | 58. 12 | 57. 43 | 0132 | 0169 |
| 3 | F. | 15. 36 | 15. 29 | 57. 16 | 56. 50 | 0202 | 0235 |
| 4 | Sa. | 15. 22 | 15. 16 | 56. 24 | 56. 1 | 0269 | 0298 |
| 5 | Su. | 15. 10 | 15. 5 | 55. 40 | 55. 21 | 0326 | 0350 |
| 6 | M. | 15. 0 | 14. 56 | 55. 3 | 54. 49 | 0374 | 0392 |
| 7 | Tu. | 14. 53 | 14. 50 | 54. 38 | 54. 28 | 0407 | 0420 |
| 8 | W. | 14. 48 | 14. 48 | 54. 21 | 54. 17 | 0430 | 0435 |
| 9 | Th. | 14. 47 | 14. 47 | 54. 14 | 54. 14 | 0439 | 0439 |
| 10 | F. | 14. 47 | 14. 49 | 54. 17 | 54. 20 | 0435 | 0431 |
| 11 | Sa. | 14. 49 | 14. 52 | 54. 25 | 54. 33 | 0424 | 0414 |
| 12 | Su. | 14. 54 | 14. 56 | 54. 40 | 54. 50 | 0404 | 0391 |
| 13 | M. | 14. 59 | 15. 2 | 55. 0 | 55. 12 | 0378 | 0362 |
| 14 | Tu. | 15. 6 | 15. 9 | 55. 25 | 55. 38 | 0345 | 0328 |
| 15 | W. | 15. 13 | 15. 17 | 55. 51 | 56. 6 | 0311 | 0292 |
| 16 | Th. | 15. 21 | 15. 25 | 56. 20 | 56. 35 | 0274 | 0255 |
| 17 | F. | 15. 29 | 15. 34 | 56. 50 | 57. 6 | 0235 | 0215 |
| 18 | Sa. | 15. 37 | 15. 42 | 57. 21 | 57. 37 | 0196 | 0176 |
| 19 | Su. | 15. 46 | 15. 51 | 57. 52 | 58. 9 | 0157 | 0136 |
| 20 | M. | 15. 55 | 16. 0 | 58. 25 | 58. 41 | 0116 | 0096 |
| 21 | Tu. | 16. 3 | 16. 8 | 58. 55 | 59. 11 | 0079 | 0060 |
| 22 | W. | 16. 11 | 16. 15 | 59. 24 | 59. 38 | 0044 | 0027 |
| 23 | Th. | 16. 18 | 16. 21 | 59. 49 | 59. 59 | 0013 | 0001 |
| 24 | F. | 16. 23 | 16. 24 | 60. 7 | 60. 13 | 9992 | 9984 |
| 25 | Sa. | 16. 25 | 16. 25 | 60. 15 | 60. 14 | 9982 | 9983 |
| 26 | Su. | 16. 24 | 16. 22 | 60. 11 | 60. 5 | 9987 | 9994 |
| 27 | M. | 16. 19 | 16. 16 | 59. 55 | 59. 42 | 0006 | 0022 |
| 28 | Tu. | 16. 11 | 16. 7 | 59. 26 | 59. 8 | 0041 | 0063 |
| 29 | W. | 16. 1 | 15. 55 | 58. 46 | 58. 25 | 0090 | 0116 |
| 30 | Th. | 15. 48 | 15. 42 | 58. 1 | 57. 37 | 0146 | 0176 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Aldebaran | 23. 15. 18 | 21. 41. 20 | 20. 9. 31 | 18. 40. 15 |
| 2 | Pollux. | 50. 8. 20 | 48. 27. 11 | 46. 46. 31 | 45. 6. 18 |
| 3 | | 36. 52. 27 | 35. 15. 6 | 33. 38. 17 | 32. 1. 56 |
| 4 | | 60. 37. 23 | 59. 2. 6 | 57. 27. 8 | 55. 52. 30 |
| 5 | Regulus. | 48. 4. 9 | 46. 31. 25 | 44. 58. 58 | 43. 26. 47 |
| 6 | | 35. 49. 35 | 34. 18. 54 | 32. 48. 27 | 31. 18. 12 |
| 7 | | 23. 49. 45 | 22. 20. 36 | 20. 51. 38 | 19. 22. 51 |
| 8 | | 65. 58. 46 | 64. 30. 7 | 63. 1. 31 | 61. 32. 55 |
| 9 | | 54. 10. 25 | 52. 41. 57 | 51. 13. 27 | 49. 44. 57 |
| 10 | Spica ♍ | 42. 22. 7 | 40. 53. 25 | 39. 24. 39 | 37. 55. 50 |
| 11 | | 30. 30. 44 | 29. 1. 31 | 27. 32. 15 | 26. 2. 55 |
| 12 | | 18. 35. 31 | 17. 6. 3 | 15. 36. 40 | 14. 7. 23 |
| 13 | | 52. 3. 37 | 50. 31. 44 | 48. 59. 41 | 47. 27. 29 |
| 14 | Antares. | 39. 44. 0 | 38. 10. 48 | 36. 37. 25 | 35. 3. 52 |
| 15 | | 27. 13. 21 | 25. 38. 40 | 24. 3. 50 | 22. 28. 47 |
| 16 | α Aquilæ | 72. 15. 3 | 70. 53. 10 | 69. 31. 25 | 68. 9. 48 |
| 17 | | 61. 24. 28 | 60. 4. 13 | 58. 44. 20 | 57. 24. 51 |
| 18 | β Capricorni. | 43. 31. 15 | 41. 52. 46 | 40. 14. 7 | 38. 35. 21 |
| 19 | | 80. 28. 37 | 78. 51. 33 | 77. 14. 19 | 75. 36. 58 |
| 20 | α Pegaſi. | 67. 28. 5 | 65. 49. 57 | 64. 11. 44 | 62. 33. 27 |
| 21 | | 54. 21. 25 | 52. 43. 2 | 51. 4. 45 | 49. 26. 36 |
| 19 | | 117. 43. 44 | 116. 10. 30 | 114. 37. 3 | 113. 3. 22 |
| 20 | | 105. 11. 31 | 103. 36. 28 | 102. 1. 11 | 100. 25. 41 |
| 21 | The Sun. | 92. 24. 44 | 90. 47. 53 | 89. 10. 47 | 87. 33. 30 |
| 22 | | 79. 23. 48 | 77. 45. 13 | 76. 6. 25 | 74. 27. 26 |
| 23 | | 66. 9. 46 | 64. 29. 40 | 62. 49. 25 | 61. 9. 1 |
| 24 | | 52. 45. 6 | 51. 3. 59 | 49. 22. 47 | 47. 41. 30 |
| 30 | Pollux. | 42. 17. 23 | 40. 36. 48 | 38. 56. 38 | 37. 16. 56 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 56. 57. 31 | 55. 14. 32 | 53. 32. 1 | 51. 49. 57 |
| 2 | Pollux. | 43. 26. 34 | 41. 47. 19 | 40. 8. 32 | 38. 30. 16 |
| 3 | | 30. 26. 7 | 28. 50. 50 | 27. 16. 5 | 25. 41. 54 |
| 4 | | 54. 18. 11 | 52. 44. 13 | 51. 10. 34 | 49. 37. 12 |
| 5 | Regulus. | 41. 54. 53 | 40. 23. 11 | 38. 51. 44 | 37. 20. 32 |
| 6 | | 29. 48. 10 | 28. 18. 18 | 26. 48. 36 | 25. 19. 5 |
| 7 | | 17. 54. 17 | 16. 25. 56 | 14. 57. 46 | 13. 29. 51 |
| 8 | | 60. 4. 22 | 58. 35. 52 | 57. 7. 21 | 55. 38. 53 |
| 9 | Spica ♍ | 48. 16. 25 | 46. 47. 54 | 45. 19. 20 | 43. 50. 45 |
| 10 | | 36. 26. 57 | 34. 57. 59 | 33. 28. 57 | 31. 59. 52 |
| 11 | | 24. 33. 32 | 23. 4. 2 | 21. 34. 32 | 20. 5. 1 |
| 12 | | 58. 9. 25 | 56. 38. 13 | 55. 6. 52 | 53. 35. 19 |
| 13 | Antares. | 45. 55. 6 | 44. 22. 35 | 42. 49. 53 | 41. 17. 1 |
| 14 | | 33. 30. 8 | 31. 56. 12 | 30. 22. 6 | 28. 47. 49 |
| 15 | α Aquilæ. | 77. 43. 0 | 76. 20. 59 | 74. 58. 58 | 73. 37. 0 |
| 16 | | 66. 48. 19 | 65. 26. 59 | 64. 5. 54 | 62. 45. 3 |
| 17 | β Capri- | 50. 3. 39 | 48. 25. 48 | 46. 47. 47 | 45. 9. 36 |
| 18 | corni. | 36. 56. 25 | 35. 17. 22 | 33. 38. 13 | 31. 58. 58 |
| 19 | | 73. 59. 27 | 72. 21. 48 | 70. 44. 1 | 69. 6. 7 |
| 20 | α Pegaſi. | 60. 55. 5 | 59. 16. 40 | 57. 38. 15 | 55. 59. 50 |
| 21 | | 47. 48. 34 | 46. 10. 46 | 44. 33. 14 | 42. 55. 58 |
| 19 | | 111. 29. 27 | 109. 55. 18 | 108. 20. 56 | 106. 46. 20 |
| 20 | | 98. 49. 56 | 97. 13. 58 | 95. 37. 47 | 94. 1. 22 |
| 21 | The Sun. | 85. 55. 59 | 84. 18. 15 | 82. 40. 18 | 81. 2. 10 |
| 22 | | 72. 48. 15 | 71. 8. 54 | 69. 29. 22 | 67. 49. 39 |
| 23 | | 59. 28. 27 | 57. 47. 46 | 56. 6. 59 | 54. 26. 6 |
| 24 | | 46. 0. 10 | 44. 18. 49 | 42. 37. 27 | 40. 56. 2 |
| 30 | Pollux. | 35. 37. 41 | 33. 58. 53 | 32. 20. 37 | 30. 42. 54 |

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Distances of ☽'s Center from ☉, and from Stars west of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 2 | | 47. 18. 54 | 48. 52. 49 | 50. 26. 20 | 51. 59. 26 |
| 3 | | 59. 38. 50 | 61. 9. 31 | 62. 39. 50 | 64. 9. 45 |
| 4 | | 71. 33. 43 | 73. 1. 27 | 74. 28. 50 | 75. 55. 53 |
| 5 | The Sun. | 83. 6. 13 | 84. 31. 24 | 85. 56. 19 | 87. 20. 57 |
| 6 | | 94. 20. 26 | 95. 43. 38 | 97. 6. 39 | 98. 29. 28 |
| 7 | | 105. 21. 1 | 106. 42. 52 | 108. 4. 35 | 109. 26. 12 |
| 8 | | 116. 12. 50 | 117. 33. 55 | 118. 54. 55 | 120. 15. 51 |
| 6 | | 44. 43. 46 | 46. 11. 58 | 47. 40. 6 | 49. 8. 10 |
| 7 | Aldebaran. | 56. 27. 28 | 57. 55. 8 | 59. 22. 42 | 60. 50. 15 |
| 8 | | 68. 7. 16 | 69. 34. 34 | 71. 1. 50 | 72. 29. 4 |
| 9 | Pollux. | 37. 15. 50 | 38. 43. 32 | 40. 11. 19 | 41. 39. 9 |
| 10 | | 11. 59. 35 | 13. 27. 18 | 14. 55. 16 | 16. 23. 30 |
| 11 | | 23. 47. 37 | 25. 16. 54 | 26. 46. 19 | 28. 15. 53 |
| 12 | Regulus. | 35. 45. 53 | 37. 16. 23 | 38. 47. 2 | 40. 17. 51 |
| 13 | | 47. 54. 10 | 49. 25. 55 | 50. 57. 50 | 52. 29. 56 |
| 14 | | 60. 12. 56 | 61. 46. 3 | 63. 19. 21 | 64. 52. 49 |
| 15 | | 18. 48. 3 | 20. 21. 45 | 21. 55. 45 | 23. 30. 1 |
| 16 | Spica ♍ | 31. 25. 17 | 33. 1. 2 | 34. 37. 0 | 36. 13. 12 |
| 17 | | 44. 17. 25 | 45. 54. 55 | 47. 32. 37 | 49. 10. 32 |
| 18 | | 57. 23. 12 | 59. 2. 19 | 60. 41. 41 | 62. 21. 14 |
| 19 | | 24. 51. 52 | 26. 32. 52 | 28. 14. 7 | 29. 55. 33 |
| 20 | Antares. | 38. 26. 5 | 40. 8. 51 | 41. 51. 51 | 43. 35. 3 |
| 21 | | 52. 14. 33 | 53. 59. 6 | 55. 43. 53 | 57. 28. 53 |
| 22 | | 66. 17. 8 | 68. 3. 26 | 69. 49. 57 | 71. 36. 41 |
| 23 | β Capricorni. | 26. 11. 46 | 27. 57. 42 | 29. 43. 57 | 31. 30. 33 |
| 24 | | 40. 27. 41 | 42. 15. 48 | 44. 4. 5 | 45. 52. 32 |
| 25 | α Aquilæ. | 59. 53. 28 | 61. 23. 38 | 62. 54. 24 | 64. 25. 48 |
| 26 | | 72. 9. 4 | 73. 42. 46 | 75. 16. 38 | 76. 50. 40 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 40. 59. 11 | 42. 34. 44 | 44. 9. 51 | 45. 44. 35 |
| 2 | | 53. 32. 7 | 55. 4. 24 | 56. 36. 16 | 58. 7. 45 |
| 3 | | 65. 39. 18 | 67. 8. 27 | 68. 37. 14 | 70. 5. 39 |
| 4 | The Sun. | 77. 22. 36 | 78. 48. 58 | 80. 15. 1 | 81. 40. 46 |
| 5 | | 88. 45. 20 | 90. 9. 27 | 91. 33. 21 | 92. 57. 0 |
| 6 | | 99. 52. 6 | 101. 14. 34 | 102. 36. 52 | 103. 59. 1 |
| 7 | | 110. 47. 42 | 112. 9. 6 | 113. 30. 25 | 114. 51. 40 |
| 6 | Aldebaran | 50. 36. 10 | 52. 4. 5 | 53. 31. 57 | 54. 59. 44 |
| 7 | | 62. 17. 43 | 63. 45. 10 | 65. 12. 34 | 66. 39. 57 |
| 8 | Pollux. | 31. 25. 48 | 32. 53. 11 | 34. 20. 40 | 35. 48. 12 |
| 9 | | 43. 7. 5 | 44. 35. 4 | 46. 3. 8 | 47. 31. 15 |
| 10 | | 17. 51 57 | 19. 20. 36 | 20. 49. 26 | 22. 18. 27 |
| 11 | | 29. 45. 36 | 31. 15. 26 | 32. 45. 26 | 34. 15. 35 |
| 12 | Regulus. | 41. 48. 49 | 43. 19. 55 | 44. 51. 10 | 46. 22. 36 |
| 13 | | 54. 2. 11 | 55. 34. 36 | 57. 7. 12 | 58. 39. 59 |
| 14 | | 66. 26. 28 | 68. 0. 18 | 69. 34. 20 | 71. 8. 33 |
| 15 | | 25. 4. 34 | 26. 39. 23 | 28. 14. 26 | 29. 49. 44 |
| 16 | Spica ♍ | 37. 49. 37 | 39. 26. 14 | 41. 3. 5 | 42. 40. 8 |
| 17 | | 50. 48. 40 | 52. 26. 59 | 54. 5. 31 | 55. 44. 15 |
| 18 | | 64. 1. 2 | 65. 41. 3 | 67. 21. 18 | 69. 1. 48 |
| 19 | | 31. 37. 14 | 33. 19. 7 | 35. 1. 13 | 36. 43. 32 |
| 20 | Antares. | 45. 18. 29 | 47. 2. 10 | 48. 46. 5 | 50. 30. 12 |
| 21 | | 59. 14. 6 | 60. 59. 31 | 62. 45. 11 | 64. 31. 2 |
| 22 | | 73. 23. 37 | 75. 10. 43 | 76. 58. 2 | 78. 45. 31 |
| 23 | ♑ Capricorni. | 33. 17. 26 | 35. 4. 38 | 36. 52. 4 | 38. 39. 45 |
| 24 | | 47. 41. 9 | 49. 29. 53 | 51. 18. 44 | 53. 7. 40 |
| 25 | ♑ Aquilæ. | 65. 57. 35 | 67. 29. 54 | 69. 2. 36 | 70. 35. 39 |
| 26 | | 78. 24. 51 | 79. 59. 9 | 81. 33. 29 | 83. 7 45 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | F. | St. Philip and St. James. |
| 2 | Sa. | |
| 3 | *Su.* | *2d Sun. Eaſt.* Inv. + |
| 4 | M. | From Eaſter in 15 Days, |
| 5 | Tu | [1 ret. |
| 6 | W. | Johnante P.L. Termbeg. |
| 7 | Th. | |
| 8 | F. | |
| 9 | Sa. | |
| 10 | *Su.* | *3d. Sunday after Eaſter.* |
| 11 | M. | From Eaſt. in 3 Weeks, |
| 12 | Tu. | [2 ret. |
| 13 | W. | |
| 14 | Th. | |
| 15 | F. | |
| 16 | Sa. | |
| 17 | *Su.* | *4th Sun. after Eaſt.* [3 ret. |
| 18 | M. | From Eaſter in 1 Month, |
| 19 | Tu. | Q. Charlotte born, 1744, |
| 20 | W. | [Dunſtan. |
| 21 | Th. | |
| 22 | F. | |
| 23 | Sa. | |
| 24 | *Su.* | *5 Su. after Eaſt. Rog. Sun.* |
| 25 | M. | From Eaſter in 5 W. 4 ret. |
| 26 | Tu. | Auguſtin, 1ſt Abp. Cant. |
| 27 | W. | Venerable Bede. |
| 28 | Th. | Aſcenſion-day, H. Thurſ. |
| 29 | F. | K. Charles II. Reſt. Mor- |
| 30 | Sa. | [row of Aſcenſ. 5 ret. |
| 31 | *Su.* | *Sunday after Aſcenſion-day.* |

## Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Firſt Quarter — | 5. | 8. | 30 |
| Full Moon —— | 13. | 8. | 26 |
| Laſt Quarter —— | 20. | 10. | 14 |
| New Moon —— | 27. | 6. | 37 |

## Other Phenomena.

D.

1. ☾ 3 poſt ζ ☿ $2^h$ 13′.
2. ☾ ε ♊ $5^h$ 12′.
3. ♂ infra Cornu bor. ☿ diff. Lat. 3′.
4. ☾ ♂ ♋ $13^h$ 18′.
8. ☾ υ ♌ $10^h$ 59′.
9. ☿ Stationary.
13. ☾ π ♏ $21^h$ 10′.
14. ☾ σ ♏ $6^h$ 0′.
☾ α ♏ $9^h$ 32′.
♀ infra Cornu bor. ☿ [diff. Lat. 20′.
16. ☾ λ ♐ $8^h$ 49′.
☾ σ ♐ $19^h$ 26′.
20. ☾ θ ♒ $11^h$ 1′.
☉ enters ♊ at $21^h$ 40′.
23. ♂ ε ♊ diff. Lat. 50′.
24. ☾ η ♈ $5^h$ 23′.
♀ ε ♊ diff. Lat. 16′.
27. ☿ ♂ ♀ diff. Lat. 37′.
28. ☾ 3 poſt ζ ☿ $11^h$ 24′
29. ☾ ε ♊ $14^h$ 11′.
☾ ♂ $22^h$ 29′: ☾ will eclipſe ♂
30. ☾ ♀ $1^h$ 49′: ♀ 12′ more North.
31. ☾ ♂ ♋ $21^h$ 38′.



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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declination North. | Equat. of Time Sub. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | F. | 1. 10. 48. 41 | 2. 33. 32 | 15. 5. 18 | 3. 7 | 8 |
| 2 | Sa. | 1. 11. 46. 48 | 2. 37. 21 | 15. 23. 20 | 3. 15 | 8 |
| 3 | Su. | 1. 12. 44. 53 | 2. 41. 10 | 15. 41. 6 | 3. 23 | 7 |
| 4 | M. | 1. 13. 42. 56 | 2. 45. 0 | 15. 58. 36 | 3. 30 | 6 |
| 5 | Tu. | 1. 14. 40. 58 | 2. 48. 51 | 16. 15. 51 | 3. 36 | 5 |
| 6 | W. | 1. 15. 38. 57 | 2. 52. 42 | 16. 32. 59 | 3. 41 | 4 |
| 7 | Th. | 1. 16. 36. 55 | 2. 56. 34 | 16. 49. 32 | 3. 45 | 4 |
| 8 | F. | 1. 17. 34. 50 | 3. 0. 26 | 17. 5. 57 | 3. 49 | 4 |
| 9 | Sa. | 1. 18. 32. 44 | 3. 4. 19 | 17. 22. 5 | 3. 53 | 3 |
| 10 | Su. | 1. 19. 30. 36 | 3. 8. 13 | 17. 37. 56 | 3. 56 | 2 |
| 11 | M. | 1. 20. 28. 26 | 3. 12. 7 | 17. 53. 29 | 3. 58 | 2 |
| 12 | Tu. | 1. 21. 26. 15 | 3. 16. 1 | 18. 8. 44 | 4. 0 | 1 |
| 13 | W. | 1. 22. 24. 2 | 3. 19. 56 | 18. 23. 41 | 4. 1 | 1 |
| 14 | Th. | 1. 23. 21. 48 | 3. 23. 52 | 18. 38. 19 | 4. 2 | 0 |
| 15 | F. | 1. 24. 19. 33 | 3. 27. 48 | 18. 52. 39 | 4. 2 | 0 |
| 16 | Sa. | 1. 25. 17. 16 | 3. 31. 45 | 19. 6. 40 | 4. 2 | 1 |
| 17 | Su. | 1. 26. 14. 58 | 3. 35. 43 | 19. 20. 21 | 4. 1 | 1 |
| 18 | M. | 1. 27. 12. 39 | 3. 39. 41 | 19. 33. 43 | 4. 0 | 3 |
| 19 | Tu. | 1. 28. 10. 20 | 3. 43. 39 | 19. 46. 46 | 3. 57 | 2 |
| 20 | W. | 1. 29. 7. 59 | 3. 47. 39 | 19. 59. 28 | 3. 55 | 3 |
| 21 | Th. | 2. 0. 5. 37 | 3. 51. 39 | 20. 11. 50 | 3. 52 | 4 |
| 22 | F. | 2. 1. 3. 14 | 3. 55. 39 | 20. 23. 51 | 3. 48 | 4 |
| 23 | Sa. | 2. 2. 0. 51 | 3. 59. 40 | 20. 35. 32 | 3. 44 | 5 |
| 24 | Su. | 2. 2. 58. 27 | 4. 3. 41 | 20. 46. 51 | 3. 39 | 6 |
| 25 | M. | 2. 3. 56. 2 | 4. 7. 43 | 20. 57. 49 | 3. 33 | 5 |
| 26 | Tu. | 2. 4. 53. 36 | 4. 11. 45 | 21. 8. 26 | 3. 28 | 7 |
| 27 | W. | 2. 5. 51. 9 | 4. 15. 48 | 21. 18. 41 | 3. 21 | 7 |
| 28 | Th. | 2. 6. 48. 41 | 4. 19. 52 | 21. 28. 34 | 3. 14 | 7 |
| 29 | F. | 2. 7. 46. 12 | 4. 23. 56 | 21. 38. 4 | 3. 7 | 8 |
| 30 | Sa. | 2. 8. 43. 42 | 4. 28. 0 | 21. 47. 12 | 2. 59 | 8 |
| 31 | Su. | 2. 9. 41. 11 | 4. 32. 5 | 21. 55. 57 | 2. 51 | 9 |

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| Days. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | s ° ′ |
| 1 | 15. 54. 5 | 1. 5, 9 | 2. 25, 3 | 0. 003754 | 10. 5. 7 |
| 7 | 15. 53. 2 | 1. 6, 4 | 2. 24, 9 | 0. 004349 | 10. 4. 48 |
| 13 | 15. 52. 0 | 1. 6, 9 | 2. 24, 6 | 0. 004904 | 10. 4. 29 |
| 19 | 15. 50. 8 | 1. 7, 3 | 2. 24, 2 | 0. 005431 | 10. 4. 10 |
| 25 | 15. 49. 8 | 1. 7. 8 | 2. 23. 9 | 0. 005906 | 10. 3. 51 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Emerſions. | | II. Satellite. Emerſions. | | III. Satellite. | |
|---|---|---|---|---|---|
| D. | h ′ ″ | D. | h ′ ″ | D. | h ′ ″ |
| 2 | 7. 37. 49 | 1 | 22. 40. 1 | 6 | 11* 7. 58 I |
| 4 | 2. 6. 45 | 5 | 11*58. 34 | 6 | 14*11. 40 E |
| 5 | 20. 35. 31 | 9 | 1. 16. 59 | 13 | 15. 7. 41 I |
| 7 | 15. 4. 21 | 12 | 14*35. 20 | 13 | 18. 10. 29 E |
| 9 | 9*33. 12 | 16 | 3. 53. 39 | 20 | 19. 6. 59 I |
| 11 | 4. 1. 52 | 19 | 17. 11. 52 | 20 | 22. 8. 51 E |
| 12 | 22. 30. 36 | 23 | 6. 30. 1 | 27 | 23. 5. 47 I |
| 14 | 16. 59. 17 | 26 | 19. 48. 4 | 28 | 2. 6. 43 E |
| 16 | 11*27. 57 | 30 | 9. *6. 6 | | |
| 18 | 5. 56. 32 | | | IV. Satellite. | |
| 20 | 0. 25. 11 | | | | |
| 21 | 18. 53. 44 | | | 5 | 23. 17. 28 I |
| 23 | 13*22. 16 | | | 6 | 2. 37. 56 E |
| 25 | 7. 50. 46 | | | 22 | 17. 18. 16. I |
| 27 | 2. 19. 16 | | | 22 | 20. 32. 10 E |
| 28 | 20. 47. 41 | | | | |
| 30 | 15. 16. 10 | | | | |



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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| **MERCURY.** greatest Elong. 17d | | | | | | |
| 1 | 8. 2. 55 | 2. 5 S | 0. 24. 1 | 1. 36 S | 7. 50 N | 22. 55 |
| 7 | 8 19. 24 | 3. 53 | 0. 24. 30 | 2. 42 | 6. 58 | 22. 37 |
| 13 | 9. 6. 13 | 5. 24 | 0. 27. 36 | 3. 17 | 7. 34 | 22. 27 |
| 19 | 9. 24. 7 | 6. 30 | 1. 2. 57 | 3. 21 | 9. 21 | 22. 24 |
| 25 | 10. 14. 3 | 6. 59 | 1. 10. 10 | 3. 0 | 12. 2 | 22. 28 |
| **VENUS.** | | | | | | |
| 1 | 3. 17. 45 | 1. 51 N | 2. 7. 56 | 0. 55 N | 22. 34 N | 1. 50 |
| 7 | 3. 27. 29 | 2. 19 | 2. 15. 10 | 1. 10 | 23. 47 | 1. 58 |
| 13 | 4. 7. 14 | 2. 42 | 2. 22. 24 | 1. 24 | 24. 39 | 2. 6 |
| 19 | 4. 16. 59 | 3. 0 | 2. 29. 35 | 1. 36 | 25. 4 | 2. 14 |
| 25 | 4. 26. 45 | 3. 14 | 3. 6. 45 | 1. 46 | 25. 3 | 2. 22 |
| **MARS.** | | | | | | |
| 1 | 3. 17. 12 | 1. 35 N | 2. 22. 38 | 1. 9 N | 24. 25 N | 2. 55 |
| 7 | 3. 19. 59 | 1. 38 | 2. 26. 28 | 1. 10 | 24. 36 | 2. 47 |
| 13 | 3. 22. 44 | 1. 40 | 3. 0. 17 | 1. 11 | 24. 39 | 2. 41 |
| 19 | 3. 25. 28 | 1. 42 | 3. 4. 7 | 1. 12 | 24. 36 | 2. 34 |
| 25 | 3. 28. 11 | 1. 44 | 3. 7. 56 | 1. 12 | 24. 26 | 2. 27 |
| **JUPITER.** | | | | | | |
| 1 | 5. 22. 10 | 1. 16 N | 5. 13. 8 | 1. 26 N | 7. 58 N | 8. 25 |
| 7 | 5. 22. 37 | 1. 16 | 5. 13. 2 | 1. 24 | 7. 58 | 8. 2 |
| 13 | 5. 23. 4 | 1. 16 | 5. 13. 3 | 1. 23 | 7. 57 | 7. 38 |
| 19 | 5. 23. 32 | 1. 16 | 5. 13. 10 | 1. 22 | 7. 53 | 7. 15 |
| 25 | 5. 23. 59 | 1. 17 | 5. 13. 24 | 1. 20 | 7. 47 | 6. 52 |
| **SATURN.** | | | | | | |
| 1 | 2. 21. 30 | 1. 15 S | 2. 17. 40 | 1. 9 S | 21. 45 N | 2. 34 |
| 7 | 2. 21. 44 | 1. 14 | 2. 18. 20 | 1. 8 | 21. 49 | 2. 13 |
| 13 | 2. 21. 57 | 1. 14 | 2. 19. 4 | 1. 7 | 21. 54 | 1. 53 |
| 19 | 2. 22. 11 | 1. 13 | 2. 19. 48 | 1. 6 | 21. 59 | 1. 32 |
| 25 | 2. 22. 24 | 1. 13 | 2. 20. 33 | 1. 6 | 22. 2 | 1. 11 |

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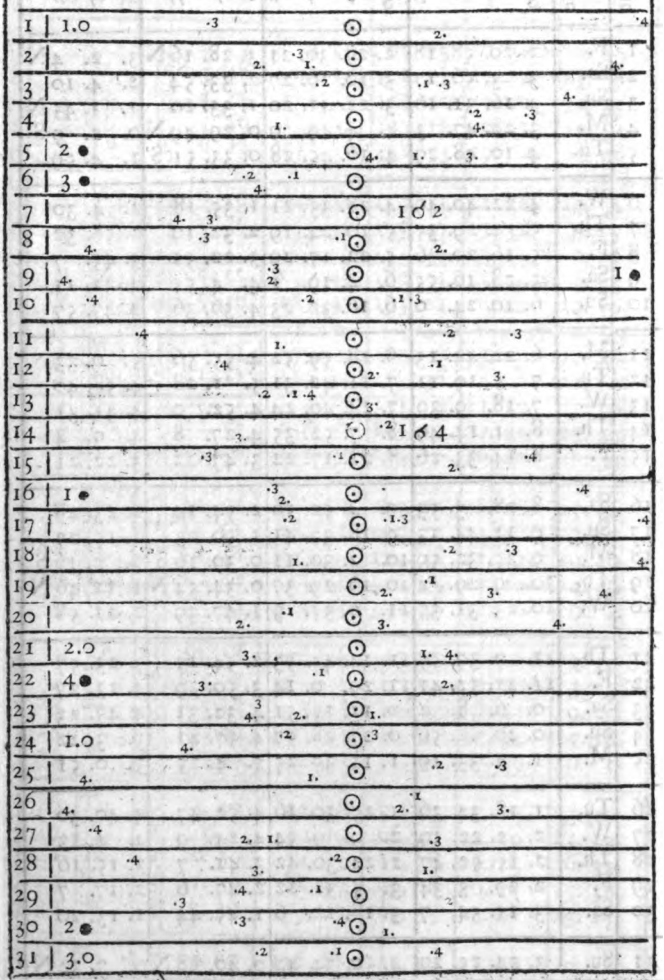
## Configurations of the SATELLITES of JUPITER at 9 o'th' Clock in the Evening.

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| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | ☽ ° ′ ″ | ☽ ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | F. | 2. 20. 58. 18 | 2. 27. 30. 21 | 3. 28. 16 N | 3. 2. 4 N |
| 2 | Sa. | 3. 3. 56. 17 | 3. 10. 16. 27 | 2. 33. 54 | 2. 4. 10 |
| 3 | Su. | 3. 16. 31. 16 | 3. 22. 41. 20 | 1. 33. 20 | 1. 1. 45 N |
| 4 | M. | 3. 28. 47. 3 | 4. 4. 49. 9 | 0. 29. 49 N | 0. 2. 9 S |
| 5 | Tu. | 4. 10. 48. 29 | 4. 16. 45. 28 | 0. 33. 51 S | 1. 4. 59 |
| 6 | W. | 4. 22. 40. 49 | 4. 28. 35. 21 | 1. 35. 18 | 2. 4. 30 |
| 7 | Th. | 5. 4. 29. 35 | 5. 10. 24. 19 | 2. 32. 19 | 2. 58. 32 |
| 8 | F. | 5. 16. 20. 6 | 5. 22. 17. 29 | 3. 22. 51 | 3. 45. 7 |
| 9 | Sa. | 5. 28. 16. 55 | 6. 4. 19. 1 | 4. 4. 55 | 4. 22. 11 |
| 10 | Su. | 6. 10. 24. 0 | 6. 16. 32. 23 | 4. 36. 36 | 4. 47. 57 |
| 11 | M. | 6. 22. 44. 13 | 6. 28. 59. 52 | 4. 55. 56 | 5. 0. 33 |
| 12 | Tu. | 7. 5. 19. 11 | 7. 11. 42. 31 | 5. 1. 28 | 4. 58. 40 |
| 13 | W. | 7. 18. 9. 39 | 7. 24. 40. 24 | 4. 52. 0 | 4. 41. 31 |
| 14 | Th. | 8. 1. 14. 49 | 8. 7. 52. 35 | 4. 27. 8 | 4. 9. 4 |
| 15 | F. | 8. 14. 33. 26 | 8. 21. 17. 22 | 3. 47. 22 | 3. 22. 21 |
| 16 | Sa. | 8. 28. 3. 53 | 9. 4. 52. 56 | 2. 54. 14 | 2. 23. 28 |
| 17 | Su. | 9. 11. 44. 13 | 9. 18. 37. 41 | 1. 50. 23 | 1. 15. 27 |
| 18 | M. | 9. 25. 32. 59 | 10. 2. 30. 11 | 0. 39. 16 S | 0. 2. 16 S |
| 19 | Tu. | 10. 9. 29. 4 | 10. 16. 29. 37 | 0. 34. 54 N | 1. 11. 46 N |
| 20 | W. | 10. 23. 31. 37 | 11. 0. 35. 9 | 1. 47. 39 | 2. 21. 58 |
| 21 | Th. | 11. 7. 39. 55 | 11. 14. 45. 53 | 2. 54. 17 | 3. 23. 57 |
| 22 | F. | 11. 21. 52. 41 | 11. 29. 0. 14 | 3. 50. 29 | 4. 13. 27 |
| 23 | Sa. | 0. 6. 8. 2 | 0. 13. 15. 51 | 4. 32. 31 | 4. 47. 23 |
| 24 | Su. | 0. 20. 22. 56 | 0. 27. 28. 57 | 4. 57. 41 | 5. 3. 22 |
| 25 | M. | 1. 4. 33. 19 | 1. 11. 35. 25 | 5. 4. 25 | 5. 0. 51 |
| 26 | Tu. | 1. 18. 34. 36 | 1. 25. 30. 26 | 4. 52. 47 | 4. 40. 30 |
| 27 | W. | 2. 2. 22. 19 | 2. 9. 9. 54 | 4. 24. 9 | 4. 4. 13 |
| 28 | Th. | 2. 15. 52. 47 | 2. 22. 30. 42 | 3. 41. 7 | 3. 15. 16 |
| 29 | F. | 2. 29. 3. 34 | 3. 5. 31. 22 | 2. 47. 6 | 2. 17. 7 |
| 30 | Sa. | 3. 11. 54. 7 | 3. 18. 12. 6 | 1. 45. 44 | 1. 13. 20 |
| 31 | Su. | 3. 24. 25. 27 | 4. 0. 34. 42 | 0. 40. 8 N | 0. 7. 32 N |

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| Days of the Month. | Days of the Week. | D's Age. | D's Paſſage over Merid. | D's Right Aſcen. at Noon. | D's Right Aſc. at Midn. | D's Declination at Noon. | D's Declination at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h ′ | ° ′ | ° ′ | ° ′ | ° ′ |
| 1 | F. | 5 | 2. 53 | 79. 54 | 87. 13 | 26. 38 N | 26. 29 N |
| 2 | Sa. | 6 | 3. 48 | 94. 22 | 101. 21 | 25. 59 | 25. 8 |
| 3 | Su. | 7 | 4. 41 | 108. 7 | 114. 41 | 23. 59 | 22. 35 |
| 4 | M. | 8 | 5. 29 | 121. 2 | 127. 10 | 20. 55 | 19. 4 |
| 5 | Tu. | 9 | 6. 14 | 133. 6 | 138. 53 | 17. 0 | 14. 48 |
| 6 | W. | 10 | 6. 57 | 144. 30 | 150. 1 | 12. 28 | 10. 2 |
| 7 | Th. | 11 | 7. 37 | 155. 26 | 160. 47 | 7. 31 | 4. 55 N |
| 8 | F. | 12 | 8. 17 | 166. 7 | 171. 26 | 2. 17 N | 0. 23 S |
| 9 | Sa. | 13 | 8. 57 | 176. 48 | 182. 13 | 3. 4 S | 5. 43 |
| 10 | Su. | 14 | 9. 39 | 187. 43 | 193. 22 | 8. 22 | 10. 56 |
| 11 | M. | 15 | 10. 23 | 199. 9 | 205. 6 | 13. 25 | 15. 48 |
| 12 | Tu. | 16 | 11. 11 | 211. 15 | 217. 38 | 18. 3 | 20. 6 |
| 13 | W. | 17 | 12. 2 | 224. 13 | 231. 4 | 21. 57 | 23. 30 |
| 14 | Th. | 18 | 12. 58 | 238. 7 | 245. 22 | 24. 47 | 25. 44 |
| 15 | F. | 19 | 13. 56 | 252. 45 | 260. 16 | 26. 20 | 26. 33 |
| 16 | Sa. | 20 | 14. 55 | 267. 51 | 275. 25 | 26. 21 | 25. 46 |
| 17 | Su. | 21 | 15. 52 | 282. 56 | 290. 22 | 24. 47 | 23. 25 |
| 18 | M. | 22 | 16. 48 | 297. 39 | 304. 48 | 21. 42 | 19. 40 |
| 19 | Tu. | 23 | 17. 40 | 311. 46 | 318. 35 | 17. 20 | 14. 46 |
| 20 | W. | 24 | 18. 30 | 325. 15 | 331. 48 | 12. 0 | 9. 4 |
| 21 | Th. | 25 | 19. 18 | 338. 16 | 344. 40 | 6. 0 S | 2. 52 S |
| 22 | F. | 26 | 20. 7 | 351. 2 | 357. 24 | 0. 18 N | 3. 29 N |
| 23 | Sa. | 27 | 20. 58 | 3. 49 | 10. 19 | 6. 37 | 9. 39 |
| 24 | Su. | 28 | 21. 49 | 16. 54 | 23. 38 | 12. 34 | 15. 18 |
| 25 | M. | 29 | 22. 44 | 30. 30 | 37. 31 | 17. 49 | 20. 5 |
| 26 | Tu. | 30 | 23. 40 | 44. 39 | 51. 57 | 22. 3 | 23. 42 |
| 27 | W. | 1 | ♂ | 59. 19 | 66. 46 | 24. 59 | 25. 53 |
| 28 | Th. | 2 | 0. 39 | 74. 13 | 81. 38 | 26. 23 | 26. 31 |
| 29 | F. | 3 | 1. 36 | 88. 57 | 96. 8 | 26. 15 | 25. 38 |
| 30 | Sa. | 4 | 2. 30 | 103. 7 | 109. 55 | 24. 41 | 23. 27 |
| 31 | Su. | 5 | 3. 20 | 116. 28 | 122. 49 | 21. 57 | 20. 11 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | F. | 15. 35 | 15. 29 | 57. 13 | 56. 49 | 0206 | 0237 |
| 2 | Sa. | 15. 23 | 15. 17 | 56. 26 | 56. 4 | 0266 | 0294 |
| 3 | Su. | 15. 11 | 15. 6 | 55. 43 | 55. 25 | 0322 | 0345 |
| 4 | M. | 15. 1 | 14. 57 | 55. 8 | 54. 53 | 0367 | 0387 |
| 5 | Tu. | 14. 54 | 14. 52 | 54. 43 | 54. 33 | 0400 | 0414 |
| 6 | W. | 14. 50 | 14. 49 | 54. 27 | 54. 24 | 0422 | 0426 |
| 7 | Th. | 14. 49 | 14. 49 | 54. 22 | 54. 23 | 0428 | 0427 |
| 8 | F. | 14. 50 | 14. 52 | 54. 27 | 54. 33 | 0422 | 0414 |
| 9 | Sa. | 14. 54 | 14. 56 | 54. 41 | 54. 50 | 0403 | 0391 |
| 10 | Su. | 15. 0 | 15. 3 | 55. 2 | 55. 15 | 0375 | 0358 |
| 11 | M. | 15. 7 | 15. 12 | 55. 30 | 55. 46 | 0339 | 0318 |
| 12 | Tu. | 15. 16 | 15. 20 | 56. 1 | 56. 17 | 0298 | 0278 |
| 13 | W. | 15. 25 | 15. 29 | 56. 35 | 56. 51 | 0255 | 0234 |
| 14 | Th. | 15. 34 | 15. 38 | 57. 8 | 57. 24 | 0213 | 0192 |
| 15 | F. | 15. 43 | 15. 47 | 57. 39 | 57. 54 | 0174 | 0155 |
| 16 | Sa. | 15. 50 | 15. 53 | 58. 8 | 58. 19 | 0137 | 0124 |
| 17 | Su. | 15. 57 | 16. 0 | 58. 32 | 58. 43 | 0107 | 0094 |
| 18 | M. | 16. 2 | 16. 5 | 58. 52 | 59. 1 | 0083 | 0072 |
| 19 | Tu. | 16. 7 | 16. 9 | 59. 8 | 59. 15 | 0063 | 0055 |
| 20 | W. | 16. 10 | 16. 11 | 59. 21 | 59. 25 | 0047 | 0042 |
| 21 | Th. | 16. 12 | 16. 13 | 59. 28 | 59. 31 | 0039 | 0035 |
| 22 | F. | 16. 13 | 16. 13 | 59. 32 | 59. 31 | 0034 | 0035 |
| 23 | Sa. | 16. 12 | 16. 12 | 59. 29 | 59. 25 | 0038 | 0042 |
| 24 | Su. | 16. 10 | 16. 8 | 59. 19 | 59. 11 | 0050 | 0060 |
| 25 | M. | 16. 5 | 16. 2 | 59. 2 | 58. 51 | 0071 | 0084 |
| 26 | Tu. | 15. 58 | 15. 54 | 58. 37 | 58. 23 | 0101 | 0119 |
| 27 | W. | 15. 50 | 15. 45 | 58. 6 | 57. 48 | 0140 | 0162 |
| 28 | Th. | 15. 40 | 15. 34 | 57. 29 | 57. 9 | 0186 | 0211 |
| 29 | F. | 15. 29 | 15. 24 | 56. 49 | 56. 30 | 0237 | 0261 |
| 30 | Sa. | 15. 18 | 15. 13 | 56. 10 | 55. 51 | 0287 | 0311 |
| 31 | Su. | 15. 8 | 15. 4 | 55. 34 | 55. 18 | 0333 | 0354 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Pollux. | 29. 5. 44 | 27. 29. 5 | 25. 53. 0 | 24. 17. 32 |
| 2 | Regulus. | 52. 41. 0 | 51. 5. 21 | 49. 30. 5 | 47. 55. 8 |
| 3 | | 40. 5. 19 | 38. 32. 15 | 36. 59. 30 | 35. 27. 2 |
| 4 | | 27. 48. 59 | 26. 18. 19 | 24. 47. 43 | 23. 17. 22 |
| 5 | | 15. 49. 34 | 14. 20. 54 | 12. 52. 39 | 11. 24. 54 |
| 6 | Spica ♍ | 57. 53. 42 | 56. 24. 54 | 54. 56. 10 | 53. 27. 28 |
| 7 | | 46. 4. 35 | 44. 36. 2 | 43. 7. 27 | 41. 38. 52 |
| 8 | | 34. 15. 25 | 32. 46. 34 | 31. 17. 40 | 29. 48. 42 |
| 9 | | 22. 23. 2 | 20. 53. 41 | 19. 24. 16 | 17. 54. 55 |
| 10 | Antares. | 55. 55. 50 | 54. 24. 18 | 52. 52. 35 | 51. 20. 39 |
| 11 | | 43. 37. 58 | 42. 4. 44 | 40. 31. 18 | 38. 57. 37 |
| 12 | | 31. 5. 53 | 29. 30. 47 | 27. 55. 27 | 26. 19. 50 |
| 13 | α Aquilæ | 75. 28. 27 | 74. 5. 7 | 72. 41. 48 | 71. 18. 31 |
| 14 | | 64. 23. 16 | 63. 0. 42 | 61. 38. 25 | 60. 16. 28 |
| 15 | β Capri-corni. | 46. 57. 47 | 45. 17. 45 | 43. 37. 35 | 41. 57. 16 |
| 16 | | 33. 33. 57 | 31. 53. 2 | 30. 12. 2 | 28. 30. 59 |
| 17 | α Pegaſi. | 70. 27. 0 | 68. 47. 53 | 67. 8. 45 | 65. 29. 34 |
| 18 | | 57. 14. 7 | 55. 35. 12 | 53. 56. 24 | 52. 17. 46 |
| 19 | α Arietis. | 84. 54. 4 | 83. 9. 4 | 81. 23. 58 | 79. 38. 47 |
| 20 | | 70. 51. 50 | 69. 6. 12 | 67. 20. 31 | 65. 34. 46 |
| 18 | The Sun. | 121. 39. 32 | 120. 2. 40 | 118. 25. 40 | 116. 48. 33 |
| 19 | | 108. 41. 12 | 107. 3. 24 | 105. 25. 31 | 103. 47. 31 |
| 20 | | 95. 36. 13 | 93. 57. 41 | 92. 19. 6 | 90. 40. 26 |
| 21 | | 82. 26. 17 | 80. 47. 17 | 79. 8. 15 | 77. 29. 11 |
| 22 | | 69. 13. 30 | 67. 34. 17 | 65. 55. 5 | 64. 15. 52 |
| 23 | | 56. 0. 8 | 54. 21. 4 | 52. 42. 3 | 51. 3. 6 |
| 24 | | 42. 49. 31 | 41. 11. 5 | 39. 32. 47 | 37. 54. 38 |
| 29 | Regulus. | 57. 33. 31 | 55. 56. 4 | 54. 18. 55 | 52. 42. 4 |
| 30 | | 44. 42. 27 | 43. 7. 25 | 41. 32. 41 | 39. 58. 15 |
| 31 | | 32. 10. 30 | 30. 37. 49 | 29. 5. 24 | 27. 33. 16 |



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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Pollux. | 22. 42. 44 | 21. 8. 43 | 19. 35. 36 | 18. 3. 22 |
| 2 | | 46. 20. 32 | 44. 46. 15 | 43. 12. 18 | 41. 38. 39 |
| 3 | Regulus. | 33. 54. 53 | 32. 23. 2 | 30. 51. 29 | 29. 20. 11 |
| 4 | | 21. 47. 17 | 20. 17. 27 | 18. 47. 53 | 17. 18. 35 |
| 5 | | 63. 49. 40 | 62. 20. 32 | 60. 51. 31 | 59. 22. 33 |
| 6 | | 51. 58. 50 | 50. 30. 15 | 49. 1. 40 | 47. 33. 8 |
| 7 | Spica ♍ | 40. 10. 15 | 38. 41. 36 | 37. 12. 55 | 35. 44. 11 |
| 8 | | 28. 19. 41 | 26. 50. 35 | 25. 21. 27 | 23. 52. 16 |
| 9 | | 16. 25. 42 | 14. 56. 35 | 13. 27. 39 | 11. 58. 55 |
| 10 | Antares. | 49. 48. 31 | 48. 16. 12 | 46. 43. 40 | 45. 10. 55 |
| 11 | | 37. 23. 43 | 35. 49. 37 | 34. 15. 17 | 32. 40. 42 |
| 12 | α Aquilæ. | 81. 1. 22 | 79. 38. 13 | 78. 15. 2 | 76. 51. 46 |
| 13 | | 69. 55. 16 | 68. 32. 4 | 67. 8. 59 | 65. 46. 3 |
| 14 | β Capri- | 53. 35. 50 | 51. 56. 36 | 50. 17. 11 | 48. 37. 35 |
| 15 | corni. | 40. 16. 48 | 38. 36. 14 | 36. 55. 35 | 35. 14. 49 |
| 16 | | 77. 2. 39 | 75. 23. 54 | 73. 45. 2 | 72. 6. 4 |
| 17 | α Pegaſi. | 63. 50. 22 | 62. 11. 13 | 60. 32. 8 | 58. 53. 6 |
| 18 | | 50. 39. 20 | 49. 1. 7 | 47. 23. 10 | 45. 45. 30 |
| 19 | α Arietis. | 77. 53. 31 | 76. 8. 13 | 74. 22. 50 | 72. 37. 22 |
| 18 | | 115. 11. 18 | 113. 33. 56 | 111. 56. 28 | 110. 18. 53 |
| 19 | | 102. 9. 26 | 100. 31. 15 | 98. 53. 0 | 97. 14. 39 |
| 20 | The Sun. | 89. 1. 42 | 87. 22. 56 | 85. 44. 6 | 84. 5. 13 |
| 21 | | 75. 50. 5 | 74. 10. 58 | 72. 31. 50 | 70. 52. 41 |
| 22 | | 62. 36. 40 | 60. 57. 29 | 59. 18. 21 | 57. 39. 13 |
| 23 | | 49. 24. 12 | 47. 45. 24 | 46. 6. 40 | 44. 28. 3 |
| 29 | | 51. 5. 33 | 49. 29. 19 | 47. 53. 24 | 46. 17. 46 |
| 30 | Regulus. | 38. 24. 7 | 36. 50. 17 | 35. 16. 43 | 33. 43. 28 |
| 31 | | 26. 1. 25 | 24. 29. 51 | 22. 58. 36 | 21. 27. 36 |

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Distances of ☽'s Center from ☉, and from Stars west of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 40. 17. 4 | 41. 47. 36 | 43. 17. 49 | 44. 47. 41 |
| 2 | | 52. 12. 10 | 53. 40. 6 | 55. 7. 43 | 56. 35. 1 |
| 3 | | 63. 46. 59 | 65. 12. 32 | 66. 37. 50 | 68. 2. 51 |
| 4 | The Sun. | 75. 4. 8 | 76. 27. 41 | 77. 51. 3 | 79. 14. 12 |
| 5 | | 86. 7. 31 | 87. 29. 41 | 88. 51. 45 | 90. 13. 40 |
| 6 | | 97. 1. 42 | 98. 23. 4 | 99. 44. 24 | 101. 5. 41 |
| 7 | | 107. 51. 33 | 109. 12. 43 | 110. 33. 56 | 111. 55. 11 |
| 6 | Pollux. | 33. 38. 12 | 35. 5. 55 | 36. 33. 41 | 38. 1. 29 |
| 7 | | 45. 20. 53 | 46. 48. 54 | 48. 16. 58 | 49. 45. 7 |
| 8 | | 20. 5. 37 | 21. 34. 12 | 23. 2. 57 | 24. 31. 52 |
| 9 | Regulus. | 31. 58. 45 | 33. 28. 38 | 34. 58. 42 | 36. 28. 56 |
| 10 | | 44. 2. 46 | 45. 34. 8 | 47. 5. 42 | 48. 37. 29 |
| 11 | | 56. 19. 34 | 57. 52. 40 | 59. 26. 1 | 60. 59. 35 |
| 12 | | 14. 59. 7 | 16. 32. 39 | 18. 6. 38 | 19. 41. 3 |
| 13 | Spica ♍ | 27. 38. 53 | 29. 15. 23 | 30. 52. 9 | 32. 29. 12 |
| 14 | | 40. 38. 32 | 42. 17. 11 | 43. 56. 3 | 45. 35. 11 |
| 15 | | 53. 54. 11 | 55. 34. 40 | 57. 15. 21 | 58. 56. 14 |
| 16 | | 21. 33. 18 | 23. 15. 29 | 24. 57. 49 | 26. 40. 20 |
| 17 | Antares. | 35. 15. 20 | 36. 58. 48 | 38. 42. 26 | 40. 26. 11 |
| 18 | | 49. 6. 54 | 50. 51. 25 | 52. 36. 4 | 54. 20. 50 |
| 19 | | 63. 6. 14 | 64. 51. 36 | 66. 37. 5 | 68. 22. 40 |
| 20 | β Capri- | 22. 51. 25 | 24. 35. 7 | 26. 19. 13 | 28. 3. 39 |
| 21 | corni. | 36. 48. 55 | 38. 34. 24 | 40. 20. 4 | 42. 5. 50 |
| 22 | α Aquilæ. | 56. 30. 37 | 57. 57. 4 | 59. 24. 13 | 60. 52. 1 |
| 23 | | 68. 18. 49 | 69. 49. 26 | 71. 20. 22 | 72. 51. 33 |
| 24 | α Pegasi. | 32. 42. 45 | 34. 15. 27 | 35. 49. 11 | 37. 23. 48 |
| 25 | | 45. 26. 11 | 47. 3. 56 | 48. 41. 58 | 50. 20. 13 |
| 31 | The Sun. | 44. 44. 30 | 46. 9. 54 | 47. 35. 5 | 49. 0. 3 |



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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 46. 17. 14 | 47. 46. 27 | 49. 15. 21 | 50. 43. 55 |
| 2 | | 58. 2. 1 | 59. 28. 41 | 60. 55. 4 | 62. 21. 10 |
| 3 | | 69. 27. 37 | 70. 52. 6 | 72. 16. 21 | 73. 40. 21 |
| 4 | The Sun. | 80. 37. 11 | 82. 0. 0 | 83. 22. 40 | 84. 45. 10 |
| 5 | | 91. 35. 28 | 92. 57. 9 | 94. 18. 44 | 95. 40. 15 |
| 6 | | 102. 26. 55 | 103. 48. 5 | 105. 9. 15 | 106. 30. 24 |
| 7 | | 113. 16. 27 | 114. 37. 43 | 115. 59. 3 | 117. 20. 29 |
| 5 | Pollux. | 27. 47. 47 | 29. 15. 19 | 30. 42. 54 | 32. 10. 32 |
| 6 | | 39. 29. 18 | 40. 57. 8 | 42. 25. 0 | 43. 52. 55 |
| 7 | | 14. 13. 4 | 15. 40. 55 | 17. 8. 58 | 18. 37. 11 |
| 8 | | 26. 0. 57 | 27. 30. 9 | 28. 59. 31 | 30. 29. 3 |
| 9 | Regulus. | 37. 59. 21 | 39. 29. 55 | 41. 0. 40 | 42. 31. 37 |
| 10 | | 50. 9. 29 | 51. 41. 40 | 53. 14. 5 | 54. 46. 43 |
| 11 | | 62. 33. 24 | 64. 7. 25 | 65. 41. 40 | 67. 16. 8 |
| 12 | | 21. 15. 54 | 22. 51. 9 | 24. 26. 45 | 26. 2. 39 |
| 13 | Spica ♍ | 34. 6. 32 | 35. 44. 8 | 37. 22. 0 | 39. 0. 8 |
| 14 | | 47. 14. 32 | 48. 54. 7 | 50. 33. 55 | 52. 13. 56 |
| 15 | | 60. 37. 20 | 62. 18. 37 | 64. 0. 5 | 65. 41. 45 |
| 16 | | 28. 23. 1 | 30. 5. 52 | 31. 48. 51 | 33. 32. 1 |
| 17 | Antares. | 42. 10. 6 | 43. 54. 7 | 45. 38. 15 | 47. 22. 31 |
| 18 | | 56. 5. 43 | 57. 50. 41 | 59. 35. 45 | 61. 20. 56 |
| 19 | ♑ Capricorni. | 16. 2. 1 | 17. 43. 26 | 19. 25. 31 | 21. 8. 12 |
| 20 | | 29. 48. 22 | 31. 33. 18 | 33. 18. 23 | 35. 3. 36 |
| 21 | α Aquilæ. | 50. 53. 31 | 52. 16. 22 | 53. 40. 13 | 55. 4. 59 |
| 22 | | 62. 20. 25 | 63. 49. 21 | 65. 18. 45 | 66. 48. 35 |
| 23 | | 26. 46. 19 | 28. 12. 50 | 29. 41. 14 | 31. 11. 17 |
| 24 | α Pegaſi. | 38. 59. 11 | 40. 35. 11 | 42. 11. 45 | 43. 48. 46 |
| 25 | | 51. 58. 39 | 53. 37. 13 | 55. 15. 51 | 56. 54. 31 |
| 30 | The Sun. | 39. 0. 38 | 40. 26. 55 | 41. 52. 59 | 43. 18. 51 |
| 31 | | 50. 24. 48 | 51. 49. 20 | 53. 13. 39 | 54. 37. 47 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | M. | Nicomede, Term ends. |
| 2 | Tu. | |
| 3 | W. | [Oxford Term ends. |
| 4 | Th. | K. George III. born 1738. |
| 5 | F. | Boniface. |
| 6 | Sa. | |
| 7 | *Su.* | *Whit-Sunday.* |
| 8 | M. | Whit-Monday. |
| 9 | Tu. | Whit-Tuesday. |
| 10 | W. | Prs. Amelia born. |
| 11 | Th. | St. Barnabas. |
| 12 | F. | |
| 13 | Sa. | |
| 14 | *Su.* | *Trinity-Sunday.* [1 ret. |
| 15 | M. | On Morrow of H. Trin. |
| 16 | Tu. | [begins. |
| 17 | W. | S. Alban, Oxford Term |
| 18 | Th. | |
| 19 | F. | Trinity Term begins. |
| 20 | Sa. | Transl. of Edw. K. of W. S. |
| 21 | *Su.* | *1st Sunday after Trinity.* |
| 22 | M. | In 8 Days of H. Trin. |
| 23 | Tu. | [2 ret. |
| 24 | W. | Nativ. of St. John Bapt. |
| 25 | Th. | |
| 26 | F. | |
| 27 | Sa. | |
| 28 | *Su.* | *2d Sunday after Trinity.* |
| 29 | M. | St. Peter. In 15 Days of |
| 30 | Tu. | [H. Trin. 3 ret. |

Phases of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| First Quarter — | 4. | 2. | 24 |
| Full Moon —— | 11. | 19. | 13 |
| Last Quarter — | 18. | 14. | 46 |
| New Moon —— | 25. | 17. | 41 |

Other Phenomena.

D.

4. ☾ ☌ ♌ 18h 57′.
10. ☾ ☍ ♏ 5h 29′.
☾ ☌ ♏ 14h 15′.
☾ ☌ ♏ 17h 44′.
12. ☾ ☌ ♐ 16h 12′.
14. ☾ ☌ ♒ 14h 1′.
19. ☿ ☌ ♋ diff. Lat. 26′.
20. ☾ ☌ ♓ 11h 18′.
21. ☉ enters ♋ at 6h 25′.
22. ☾ ☌ Pleiadum 21h 16′.
24. ☾ 3 post ☌ ♉ 19h 15′.
25. ☾ ☌ ♊ 22h 14′.
28. ☾ ☌ ♌ 5h 39′.

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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declination North. | Equat. of Time Sub. | Diff. |
|---|---|---|---|---|---|---|
| | | s ☉ / // | h / // | ° / // | / // | // |
| 1 | M. | 2. 10. 38. 38 | 4. 36. 11 | 22. 4. 20 | 2. 42 | 8 |
| 2 | Tu. | 2. 11. 36. 4 | 4. 40. 16 | 22. 12. 19 | 2. 34 | 10 |
| 3 | W. | 2. 12. 33. 30 | 4. 44. 22 | 22. 19. 55 | 2. 24 | 9 |
| 4 | Th. | 2. 13. 30. 54 | 4. 48. 29 | 22. 27. 8 | 2. 15 | 10 |
| 5 | F. | 2. 14. 28. 16 | 4. 52. 35 | 22. 33. 58 | 2. 5 | 11 |
| 6 | Sa. | 2. 15. 25. 38 | 4. 56. 42 | 22. 40. 23 | 1. 54 | 11 |
| 7 | *Su.* | 2. 16. 22. 58 | 5. 0. 50 | 22. 46. 25 | 1. 43 | 11 |
| 8 | M. | 2. 17. 20. 18 | 5. 4 57 | 22. 52. 3 | 1. 32 | 12 |
| 9 | Tu. | 2. 18. 17. 37 | 5. 9. 5 | 22. 57. 17 | 1. 20 | 11 |
| 10 | W. | 2. 19. 14. 54 | 5. 13. 13 | 23. 2. 6 | 1. 9 | 12 |
| 11 | Th. | 2. 20. 12. 11 | 5. 17. 21 | 23. 6. 31 | 0. 57 | 12 |
| 12 | F. | 2. 21. 9. 27 | 5. 21. 30 | 23. 10. 33 | 0. 45 | 12 |
| 13 | Sa. | 2. 22. 6. 43 | 5. 25. 39 | 23. 14. 9 | 0. 33 | 13 |
| 14 | *Su.* | 2. 23. 3. 58 | 5. 29. 47 | 23. 17. 20 | 0. 20 | 12 |
| 15 | M. | 2. 24. 1. 12 | 5. 33. 56 | 23. 20. 9 | 0. 8 | 13 |
| 16 | Tu. | 2. 24. 58. 28 | 5. 38. 6 | 23. 22. 32 | Add. 5 | 13 |
| 17 | W. | 2. 25. 55. 43 | 5. 42. 15 | 23. 24. 30 | 0. 18 | 12 |
| 18 | Th. | 2. 26. 52. 57 | 5. 46. 24 | 23. 26. 4 | 0. 30 | 14 |
| 19 | F. | 2. 27. 50. 12 | 5. 50. 34 | 23. 27. 12 | 0. 44 | 12 |
| 20 | Sa. | 2. 28. 47. 26 | 5. 54. 44 | 23. 27. 56 | 0. 56 | 13 |
| 21 | *Su.* | 2. 29. 44. 41 | 5. 58. 53 | 23. 28. 15 | 1. 9 | 14 |
| 22 | M. | 3. 0. 41. 55 | 6. 3. 2 | 23. 28. 9 | 1. 23 | 12 |
| 23 | Tu. | 3. 1. 39. 9 | 6. 7. 12 | 23. 27. 39 | 1. 35 | 13 |
| 24 | W. | 3. 2. 36. 24 | 6. 11. 21 | 23. 26. 43 | 1. 48 | 13 |
| 25 | Th. | 3. 3. 33. 38 | 6. 15. 31 | 23. 25. 23 | 2. 1 | 13 |
| 26 | F. | 3. 4. 30. 52 | 6. 19. 40 | 23. 23. 38 | 2. 14 | 12 |
| 27 | Sa. | 3. 5. 28. 6 | 6. 23. 50 | 23. 21. 29 | 2. 26 | 12 |
| 28 | *Su.* | 3. 6. 25. 20 | 6. 27. 59 | 23. 18. 54 | 2. 38 | 13 |
| 29 | M. | 3. 7. 22. 34 | 6. 32. 7 | 23. 15. 55 | 2. 51 | 12 |
| 30 | Tu. | 3. 8. 19. 47 | 6. 36. 16 | 23. 12. 32 | 3. 3 | 11 |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | s ° ′ |
| 1 | 15. 48, 8 | 1. 8, 3 | 2. 23, 6 | 0. 006356 | 10. 3. 28 |
| 7 | 15. 48, 1 | 1. 8, 5 | 2. 23, 3 | 0. 006657 | 10. 3. 9 |
| 13 | 15. 47, 5 | 1. 8, 7 | 2. 23, 2 | 0. 006898 | 10. 2. 50 |
| 19 | 15. 47, 1 | 1. 8, 8 | 2. 23, 0 | 0. 007096 | 10. 2. 31 |
| 25 | 15. 47, 0 | 1. 8, 8 | 2. 23, 0 | 0. 007217 | 10. 2. 12 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Emersions. | | II. Satellite. Emersions. | | III. Satellite. | | |
|---|---|---|---|---|---|---|
| Days | h ′ ″ | Days | h ′ ″ | Days | h ′ ″ | |
| 1 | 9*44. 32 | 2 | 22. 24. 3 | 4 | 3. 4. 16 | I |
| 3 | 4. 12. 59 | 6 | 11*42. 1 | 4 | 6. 4. 18 | E |
| 4 | 22. 41. 26 | 10 | 0. 59. 51 | 11 | 7. 2. 23 | I |
| 6 | 17. 9. 43 | 13 | 14. 17. 37 | 11 | 10* 1. 29 | E |
| 8 | 11*38. 5 | 17 | 3. 35. 27 | 18 | 11* 0. 22 | I |
| 10 | 6. 6. 20 | 20 | 16. 53. 16 | 18 | 13. 58. 30 | E |
| 12 | 0. 34. 42 | 24 | 6. 11. 12 | 25 | 14. 58. 16 | I |
| 13 | 19. 2. 56 | 27 | 19. 29. 15 | 25 | 17. 55. 24 | E |
| 15 | 13. 31. 15 | | | | | |
| 17 | 7. 59. 37 | | | IV. Satellite. | | |
| 19 | 2. 27. 47 | | | | | |
| 20 | 20. 56. 2 | | | 8 | 11*17. 11 | I |
| 22 | 15. 24. 20 | | | 8 | 14. 24. 21 | E |
| 24 | 9*52. 36 | | | 25 | 5. 14. 37 | I |
| 26 | 4. 20. 49 | | | 25 | 8. 14. 37 | E |
| 27 | 22. 49. 2 | | | | | |
| 29 | 17. 17. 21 | | | | | |

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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | **MERCURY.** | | | | sup. ☌ 20d 8h | |
| 1 | 11. 11. 22 | 6. 18 S | 1. 20. 37 | 2. 10 S | 15. 50 N | 22. 41 |
| 7 | 0. 9. 45 | 4. 7 | 2. 1. 14 | 1. 10 | 19. 17 | 22. 59 |
| 13 | 1. 13. 26 | 0. 17 | 2. 13. 15 | 0. 4 | 22. 22 | 23. 26 |
| 19 | 2. 20. 49 | 4. 2 N | 2. 26. 13 | 0. 56 N | 24. 21 | 23. 57 |
| 25 | 3. 27. 31 | 6. 39 | 3. 9. 14 | 1. 37 | 24. 46 | 0. 25 |
| | **VENUS.** | | | | | |
| 1 | 5. 8. 7 | 3. 22 N | 3. 15. 4 | 1. 54 N | 24. 32 N | 2. 30 |
| 7 | 5. 17. 52 | 3. 23 | 3. 22. 8 | 1. 59 | 23. 37 | 2. 36 |
| 13 | 5. 27. 35 | 3. 18 | 3. 29. 11 | 2. 0 | 22. 19 | 2. 40 |
| 19 | 6. 7. 17 | 3. 8 | 4. 6. 9 | 1. 58 | 20. 40 | 2. 45 |
| 25 | 6. 16. 58 | 2. 52 | 4. 13. 5 | 1. 52 | 18. 42 | 2. 50 |
| | **MARS.** | | | | | |
| 1 | 4. 1. 20 | 1. 46 N | 3. 12. 22 | 1. 12 N | 24. 5 N | 2. 18 |
| 7 | 4. 4. 2 | 1. 48 | 3. 16. 10 | 1. 12 | 23. 41 | 2. 10 |
| 13 | 4. 6. 43 | 1. 49 | 3. 19. 58 | 1. 12 | 23. 10 | 2. 1 |
| 19 | 4. 9. 23 | 1. 50 | 3. 23. 46 | 1. 12 | 22. 33 | 1. 53 |
| 25 | 4. 12. 2 | 1. 50 | 3. 27. 34 | 1. 12 | 21. 51 | 1. 44 |
| | **JUPITER.** | | | | □ 4d 12h 40′ | |
| 1 | 5. 24. 31 | 1. 17 N | 5. 13. 47 | 1. 19 N | 7. 36 N | 6. 26 |
| 7 | 5. 24. 58 | 1. 17 | 5. 14. 13 | 1. 18 | 7. 25 | 6. 3 |
| 13 | 5. 25. 26 | 1. 17 | 5. 14. 46 | 1. 17 | 7. 12 | 5. 40 |
| 19 | 5. 25. 53 | 1. 17 | 5. 15. 22 | 1. 15 | 6. 56 | 5. 17 |
| 25 | 5. 26. 20 | 1. 17 | 5. 16. 4 | 1. 14 | 6. 38 | 4. 54 |
| | **SATURN.** | | | | ☌ 14d 2h | |
| 1 | 2. 22. 40 | 1. 12 S | 2. 21. 27 | 1. 5 S | 22. 7 N | 0. 47 |
| 7 | 2. 22. 53 | 1. 12 | 2. 22. 14 | 1. 4 | 22. 11 | 0. 25 |
| 13 | 2. 23. 7 | 1. 11 | 2. 23. 1 | 1. 4 | 22. 13 | 0. 4 |
| 19 | 2. 23. 20 | 1. 11 | 2. 23. 48 | 1. 3 | 22. 16 | 23. 39 |
| 25 | 2. 23. 34 | 1. 10 | 2. 24. 34 | 1. 3 | 22. 18 | 23. 17 |

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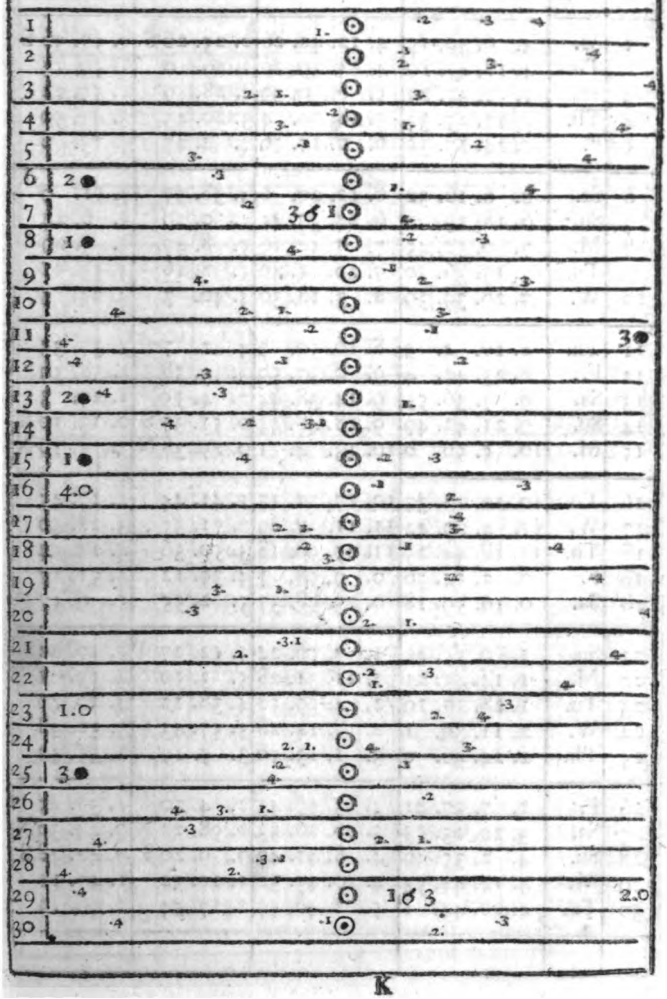
## Configurations of the SATELLITES of JUPITER at 10 o' th' Clock in the Evening.



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# JUNE 1767.

| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | M. | 4. 6. 40. 15 | 4. 12. 42. 26 | 0. 25. 26 S | 0. 57. 36 S |
| 2 | Tu. | 4. 18. 41. 59 | 4. 24. 39. 26 | 1. 29. 0 | 1. 59. 14 |
| 3 | W. | 5. 0. 35. 26 | 5. 6. 30. 39 | 2. 28. 9 | 2. 55. 22 |
| 4 | Th. | 5. 12. 25. 34 | 5. 18. 21. 4 | 3. 20. 43 | 3. 43. 50 |
| 5 | F. | 5. 24. 17. 35 | 6. 0. 15. 56 | 4. 4. 47 | 4. 23. 6 |
| 6 | Sa. | 6. 6. 16. 32 | 6. 12. 20. 6 | 4. 38. 37 | 4. 51. 9 |
| 7 | Su. | 6. 18. 27. 2 | 6. 24. 37. 45 | 5. 0. 29 | 5. 6. 24 |
| 8 | M. | 7. 0. 52. 45 | 7. 7. 12. 10 | 5. 8. 47 | 5. 7. 29 |
| 9 | Tu. | 7. 13. 36. 30 | 7. 20. 5. 40 | 5. 2. 16 | 4. 53. 11 |
| 10 | W. | 7. 26. 39. 39 | 8. 3. 18. 30 | 4. 40. 3 | 4. 23. 3 |
| 11 | Th. | 8. 10. 2. 3 | 8. 16. 50. 2 | 4. 2. 7 | 3. 37. 33 |
| 12 | F. | 8. 23. 42. 4 | 9. 0. 37. 50 | 3. 9. 38 | 2. 38. 39 |
| 13 | Sa. | 9. 7. 36. 55 | 9. 14. 38. 44 | 2. 4. 55 | 1. 29. 3 |
| 14 | Su. | 9. 21. 42. 49 | 9. 28. 48. 44 | 0. 51. 37 S | 0. 13. 10 S |
| 15 | M. | 10. 5. 56. 0 | 10. 13. 4. 1 | 0. 25. 38 N | 1. 4. 10 N |
| 16 | Tu. | 10. 20. 12. 37 | 10. 27. 21. 17 | 1. 41. 44 | 2. 17. 45 |
| 17 | W. | 11. 4. 29. 42 | 11. 11. 37. 29 | 2. 51. 35 | 3. 22. 40 |
| 18 | Th. | 11. 18. 44. 25 | 11. 25. 50. 18 | 3. 50. 36 | 4. 14. 54 |
| 19 | F. | 0. 2. 54. 56 | 0. 9. 58. 1 | 4. 35. 12 | 4. 51. 17 |
| 20 | Sa. | 0. 16. 59. 18 | 0. 23. 58. 37 | 5. 2. 55 | 5. 9. 57 |
| 21 | Su. | 1. 0. 55. 42 | 1. 7. 50. 24 | 5. 12. 27 | 5. 10. 22 |
| 22 | M. | 1. 14. 42. 21 | 1. 21. 31. 28 | 5. 3. 50 | 4. 53. 1 |
| 23 | Tu. | 1. 28. 17. 19 | 2. 4. 59. 52 | 4. 38. 12 | 4. 19. 41 |
| 24 | W. | 2. 11. 39. 1 | 2. 18. 14. 28 | 3. 57. 43 | 3. 32. 48 |
| 25 | Th. | 2. 24. 46. 9 | 3. 1. 13. 50 | 3. 5. 19 | 2. 35. 42 |
| 26 | F. | 3. 7. 37. 41 | 3. 13. 57. 43 | 2. 4. 20 | 1. 31. 45 |
| 27 | Sa. | 3. 20. 13. 53 | 3. 26. 26. 33 | 0. 58. 22 N | 0. 24. 30 N |
| 28 | Su. | 4. 2. 35. 46 | 4. 8. 41. 47 | 0. 9. 20 S | 0. 42. 48 S |
| 29 | M. | 4. 14. 44. 53 | 4. 20. 45. 32 | 1. 15. 32 | 1. 47. 11 |
| 30 | Tu. | 4. 26. 44. 1 | 5. 2. 40. 57 | 2. 17. 34 | 2. 46. 19 |

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| Days of the Month. | Days of the Week. | D's Age. | D's Passage over Merid. | D's Right Ascen. at Noon. | D's Right Asc. at Midn. | D's Declinat. at Noon. | D's Declin. at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h / | ° / | ° / | ° / | ° / |
| 1 | M. | 6 | 4. 7 | 128. 57 | 134. 54 | 18. 13 N | 16. 6 N |
| 2 | Tu. | 7 | 4. 51 | 140. 40 | 146. 17 | 13. 50 | 11. 27 |
| 3 | W. | 8 | 5. 32 | 151. 46 | 157. 10 | 8. 58 | 6. 25 |
| 4 | Th. | 9 | 6. 11 | 162. 30 | 167. 50 | 3. 48 N | 1. 10 N |
| 5 | F. | 10 | 6. 51 | 173. 9 | 178. 30 | 1. 28 S | 4. 8 S |
| 6 | Sa. | 11 | 7. 31 | 183. 55 | 189. 26 | 6. 45 | 9. 21 |
| 7 | Su. | 12 | 8. 14 | 195. 4 | 200. 52 | 11. 52 | 14. 18 |
| 8 | M. | 13 | 8. 59 | 206. 52 | 213. 5 | 16. 37 | 18. 46 |
| 9 | Tu. | 14 | 9. 49 | 219. 31 | 226. 13 | 20. 45 | 22. 29 |
| 10 | W. | 15 | 10. 43 | 233. 10 | 240. 21 | 23. 58 | 25. 9 |
| 11 | Th. | 16 | 11. 41 | 247. 44 | 255. 18 | 25. 58 | 26. 26 |
| 12 | F. | 17 | 12. 40 | 262. 58 | 270. 42 | 26. 29 | 26. 7 |
| 13 | Sa. | 18 | 13. 39 | 278. 26 | 286. 5 | 25. 20 | 24. 9 |
| 14 | Su. | 19 | 14. 37 | 293. 37 | 301. 0 | 22. 34 | 20. 39 |
| 15 | M. | 20 | 15. 32 | 308. 12 | 315. 13 | 18. 24 | 15. 53 |
| 16 | Tu. | 21 | 16. 23 | 322. 4 | 328. 46 | 13. 9 | 10. 15 |
| 17 | W. | 22 | 17. 13 | 335. 19 | 341. 46 | 7. 13 | 4. 5 S |
| 18 | Th. | 23 | 18. 1 | 348. 8 | 354. 29 | 0. 55 S | 2. 14 N |
| 19 | F. | 24 | 18. 49 | 0. 51 | 7. 14 | 5. 22 N | 8. 25 |
| 20 | Sa. | 25 | 19. 40 | 13. 40 | 20. 13 | 11. 21 | 14. 7 |
| 21 | Su. | 26 | 20. 32 | 26. 54 | 33. 42 | 16. 41 | 19. 1 |
| 22 | M. | 27 | 21. 27 | 40. 38 | 47. 43 | 21. 6 | 22. 53 |
| 23 | Tu. | 28 | 22. 23 | 54. 54 | 62. 11 | 24. 20 | 25. 25 |
| 24 | W. | 29 | 23. 19 | 69. 31 | 76. 52 | 26. 9 | 26. 29 |
| 25 | Th. | 1 | ♂ | 84. 10 | 91. 22 | 26. 27 | 26. 4 |
| 26 | F. | 2 | 0. 15 | 98. 27 | 105. 21 | 25. 19 | 24. 16 |
| 27 | Sa. | 3 | 1. 7 | 112. 3 | 118. 33 | 22. 54 | 21. 18 |
| 28 | Su. | 4 | 1. 55 | 124. 51 | 130. 56 | 19. 28 | 17. 25 |
| 29 | M. | 5 | 2. 40 | 136. 51 | 142. 35 | 15. 14 | 12. 54 |
| 30 | Tu. | 6 | 3. 23 | 148. 10 | 153. 39 | 10. 28 | 7. 57 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | M. | 15. 0 | 14. 57 | 55. 4 | 54. 51 | 0373 | 0390 |
| 2 | Tu. | 14. 54 | 14. 52 | 54. 41 | 54. 34 | 0403 | 0412 |
| 3 | W. | 14. 50 | 14. 50 | 54. 28 | 54. 25 | 0420 | 0424 |
| 4 | Th. | 14. 50 | 14. 51 | 54. 25 | 54. 28 | 0424 | 0420 |
| 5 | F. | 14. 52 | 14. 54 | 54. 32 | 54. 40 | 0415 | 0404 |
| 6 | Sa. | 14. 56 | 14. 59 | 54. 49 | 55. 1 | 0392 | 0377 |
| 7 | Su. | 15. 4 | 15. 7 | 55. 16 | 55. 31 | 0357 | 0337 |
| 8 | M. | 15. 13 | 15. 18 | 55. 50 | 56. 9 | 0313 | 0288 |
| 9 | Tu. | 15. 24 | 15. 29 | 56. 30 | 56. 51 | 0261 | 0234 |
| 10 | W. | 15. 35 | 15. 41 | 57. 12 | 57. 34 | 0208 | 0180 |
| 11 | Th. | 15. 47 | 15. 51 | 57. 54 | 58. 13 | 0155 | 0131 |
| 12 | F. | 15. 57 | 16. 1 | 58. 32 | 58. 48 | 0107 | 0088 |
| 13 | Sa. | 16. 5 | 16. 9 | 59. 3 | 59. 15 | 0069 | 0055 |
| 14 | Su. | 16. 11 | 16. 14 | 59. 25 | 59. 33 | 0042 | 0033 |
| 15 | M. | 16. 15 | 16. 16 | 59. 38 | 59. 42 | 0027 | 0022 |
| 16 | Tu. | 16. 16 | 16. 16 | 59. 42 | 59. 41 | 0022 | 0023 |
| 17 | W. | 16. 15 | 16. 14 | 59. 39 | 59. 35 | 0025 | 0030 |
| 18 | Th. | 16. 13 | 16. 11 | 59. 29 | 59. 22 | 0038 | 0046 |
| 19 | F. | 16. 9 | 16. 6 | 59. 15 | 59. 6 | 0055 | 0066 |
| 20 | Sa. | 16. 4 | 16. 1 | 58. 56 | 58. 46 | 0078 | 0090 |
| 21 | Su. | 15. 58 | 15. 55 | 58. 35 | 58. 23 | 0104 | 0119 |
| 22 | M. | 15. 51 | 15. 48 | 58. 11 | 57. 58 | 0134 | 0150 |
| 23 | Tu. | 15. 44 | 15. 40 | 57. 44 | 57. 29 | 0167 | 0186 |
| 24 | W. | 15. 36 | 15. 31 | 57. 14 | 56. 58 | 0205 | 0225 |
| 25 | Th. | 15. 27 | 15. 22 | 56. 43 | 56. 27 | 0244 | 0265 |
| 26 | F. | 15. 19 | 15. 14 | 56. 11 | 55. 55 | 0285 | 0306 |
| 27 | Sa. | 15. 10 | 15. 6 | 55. 41 | 55. 25 | 0324 | 0345 |
| 28 | Su. | 15. 2 | 14. 59 | 55. 12 | 55. 0 | 0362 | 0378 |
| 29 | M. | 14. 56 | 14. 54 | 54. 49 | 54. 39 | 0392 | 0406 |
| 30 | Tu. | 14. 51 | 14. 50 | 54. 31 | 54. 25 | 0416 | 0424 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Regulus. | 19. 56. 55 | 18. 26. 37 | 16. 56. 40 | 15. 27. 6 |
| 2 | | 61. 52. 31 | 60. 22. 50 | 58. 53. 18 | 57. 23. 54 |
| 3 | Spica ♍ | 49. 58. 31 | 48. 29. 41 | 47. 0. 55 | 45. 32. 12 |
| 4 | | 38. 9. 29 | 36. 40. 57 | 35. 12. 25 | 33. 43. 52 |
| 5 | | 26. 21. 7 | 24. 52. 29 | 23. 23. 50 | 21. 55. 9 |
| 6 | | 60. 2. 18 | 58. 31. 56 | 57. 1. 23 | 55. 30. 40 |
| 7 | Antares. | 47. 54. 5 | 46. 22. 7 | 44. 49. 54 | 43. 17. 27 |
| 8 | | 35. 31. 15 | 33. 57. 13 | 32. 22. 52 | 30. 48. 14 |
| 9 | α Aquilæ | 79. 25. 57 | 78. 2. 28 | 76. 38. 53 | 75. 15. 11 |
| 10 | | 68. 15. 53 | 66. 52. 2 | 65. 28. 17 | 64. 4. 40 |
| 11 | β Capricorni. | 51. 27. 22 | 49. 46. 24 | 48. 5. 11 | 46. 23. 43 |
| 12 | | 37. 52. 52 | 36. 10. 6 | 34. 27. 9 | 32. 44. 3 |
| 13 | | 74. 22. 59 | 72. 41. 37 | 71. 0. 11 | 69. 18. 39 |
| 14 | α Pegaſi. | 60. 50. 34 | 59. 8. 59 | 57. 27. 31 | 55. 46. 10 |
| 15 | | 47. 22. 14 | 45. 42. 21 | 44. 2. 54 | 42. 23. 56 |
| 16 | | 74. 8. 56 | 72. 21. 49 | 70. 34. 45 | 68. 47. 42 |
| 17 | α Arietis. | 59. 53. 13 | 58. 6. 32 | 56. 19. 57 | 54. 33. 29 |
| 18 | | 45. 42. 42 | 43. 56. 54 | 42. 11. 16 | 40. 25. 47 |
| 17 | | 111. 24. 20 | 109. 44. 26 | 108. 4. 36 | 106. 24. 54 |
| 18 | | 98. 7. 26 | 96. 28. 11 | 94. 49. 2 | 93. 9. 58 |
| 19 | | 84. 56. 15 | 83. 17. 50 | 81. 39. 33 | 80. 1. 23 |
| 20 | The Sun. | 71. 52. 32 | 70. 15. 10 | 68. 37. 55 | 67. 0. 51 |
| 21 | | 58. 57. 33 | 57. 21. 21 | 55. 45. 19 | 54. 9. 26 |
| 22 | | 46. 12. 30 | 44. 37. 36 | 43. 2. 54 | 41. 28. 23 |
| 23 | | | | | |
| 28 | | 78. 0. 37 | 76. 28. 36 | 74. 56. 45 | 73. 25. 7 |
| 29 | Spica ♍ | 65. 49. 46 | 64. 19. 14 | 62. 48. 50 | 61. 18. 37 |
| 30 | | 53. 49. 46 | 52. 20. 23 | 50. 51. 7 | 49. 21. 58 |

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Distances of ☽'s Center from Stars, and from ☉ east of her

| Days | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 67. 52. 45 | 66. 22. 29 | 64. 52. 22 | 63. 22. 22 |
| 2 | | 55. 54. 38 | 54. 25. 28 | 52. 56. 23 | 51. 27. 25 |
| 3 | Spica ♍ | 44. 3. 34 | 42. 35. 0 | 41. 6. 29 | 39. 37. 59 |
| 4 | | 32. 15. 20 | 30. 46. 48 | 29. 18. 15 | 27. 49. 41 |
| 5 | | 20. 26. 29 | 18. 57. 53 | 17. 29. 19 | 16. 0. 49 |
| 6 | | 53. 59. 46 | 52. 28. 40 | 50. 57. 21 | 49. 25. 49 |
| 7 | Antares. | 41. 44. 45 | 40. 11. 46 | 38. 38. 32 | 37. 5. 1 |
| 8 | | 84. 58. 8 | 83. 35. 22 | 82. 12. 25 | 80. 49. 17 |
| 9 | α Aquilæ. | 73. 51. 24 | 72. 27. 32 | 71. 3. 39 | 69. 39. 46 |
| 10 | β Capri- | 58. 8. 22 | 56. 28. 33 | 54. 48. 26 | 53. 8. 3 |
| 11 | corni. | 44. 42. 0 | 43. 0. 2 | 41. 17. 51 | 39. 35. 28 |
| 12 | | 81. 7. 6 | 79. 26. 17 | 77. 45. 20 | 76. 4. 14 |
| 13 | α Pegasi. | 67. 37. 4 | 65. 55. 26 | 64. 13. 48 | 62. 32. 11 |
| 14 | | 54. 4. 56 | 52. 23. 52 | 50. 43. 2 | 49. 2. 29 |
| 15 | | 40. 45. 30 | 39. 7. 44 | 37. 30. 42 | 35. 54. 27 |
| 16 | | 67. 0. 42 | 65. 13. 44 | 63. 26. 50 | 61. 39. 59 |
| 17 | α Arietis. | 52. 47. 6 | 51. 0. 49 | 49. 14. 39 | 47. 28. 37 |
| 18 | | 38. 40. 27 | 36. 55. 16 | 35. 10. 19 | 33. 25. 34 |
| 16 | | 118. 4. 30 | 116. 24. 22 | 114. 44. 18 | 113. 4. 17 |
| 17 | | 104. 45. 15 | 103. 5. 40 | 101. 26. 11 | 99. 46. 47 |
| 18 | | 91. 31. 1 | 89. 42. 9 | 88. 13. 25 | 86. 34. 46 |
| 19 | The Sun. | 78. 23. 21 | 76. 45. 27 | 75. 7. 40 | 73. 30. 2 |
| 20 | | 65. 23. 53 | 63. 47. 5 | 62. 10. 25 | 60. 33. 55 |
| 21 | | 52. 33. 43 | 50. 58. 10 | 49. 22. 46 | 47. 47. 33 |
| 22 | | 39. 54. 4 | | | |
| 27 | | 84. 10. 48 | 82. 37. 57 | 81. 5. 18 | 79. 32. 52 |
| 28 | Spica ♍ | 71. 53. 40 | 70. 22. 25 | 68. 51. 21 | 67. 20. 28 |
| 29 | | 59. 48. 33 | 58. 18. 39 | 56. 48. 53 | 55. 19. 16 |
| 30 | | 47. 52. 56 | 46. 24. 0 | 44. 55. 10 | 42. 26. 26 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 56. 1. 41 | 57. 25. 22 | 58. 48. 53 | 60. 12. 13 |
| 2 | | 67. 6. 24 | 68. 28. 48 | 69. 51. 5 | 71. 13. 15 |
| 3 | The Sun. | 78. 2. 37 | 79. 24. 16 | 80. 45. 52 | 82. 7. 26 |
| 4 | | 88. 54. 48 | 90. 16. 17 | 91. 37. 48 | 92. 59. 22 |
| 5 | | 99. 47. 48 | 101. 9. 45 | 102. 31. 48 | 103. 53. 58 |
| 6 | | 110. 46. 37 | 112. 9. 35 | 113. 32. 45 | 114. 56. 7 |
| 4 | | 16. 16. 5 | 17. 43. 55 | 19. 11. 53 | 20. 39. 59 |
| 5 | Regulus. | 28. 2. 28 | 29. 31. 22 | 31. 0. 24 | 32. 29. 35 |
| 6 | | 39. 57. 43 | 41. 27. 51 | 42. 58. 11 | 44. 28. 42 |
| 7 | | 52. 4. 28 | 53. 36. 17 | 55. 8. 20 | 56. 40. 40 |
| 8 | | 10. 42. 46 | 12. 13. 44 | 13. 45. 27 | 15. 17. 54 |
| 9 | Spica ♍ | 23. 9. 6 | 24. 44. 46 | 26. 20. 49 | 27. 57. 17 |
| 10 | | 36. 5. 5 | 37. 43. 43 | 39. 22. 42 | 41. 2. 1 |
| 11 | | 49. 23. 36 | 51. 4. 52 | 52. 46. 26 | 54. 28. 18 |
| 12 | | 17. 11. 25 | 18. 55. 9 | 20. 39. 6 | 22. 23. 20 |
| 13 | Antares. | 31. 7. 48 | 32. 53. 19 | 34. 39. 0 | 36. 24. 52 |
| 14 | | 45. 16. 33 | 47. 3. 17 | 48. 50. 8 | 50. 37. 6 |
| 15 | | 59. 33. 12 | 61. 20. 34 | 63. 7. 58 | 64. 55. 25 |
| 16 | β Capri- | 19. 35. 15 | 21. 19. 58 | 23. 4. 59 | 24. 50. 16 |
| 17 | corni. | 33. 39. 26 | 35. 25. 31 | 37. 11. 36 | 38. 57. 43 |
| 18 | α Aquilæ. | 53. 53. 40 | 55. 18. 42 | 56. 44. 25 | 58. 10. 48 |
| 19 | | 65. 30. 37 | 66. 59. 47 | 68. 29. 13 | 69. 58. 55 |
| 20 | | 29. 44. 12 | 31. 13. 18 | 32. 43. 38 | 34. 15. 0 |
| 21 | α Pegaſi. | 42. 3. 12 | 43. 38. 25 | 45. 13. 56 | 46. 49. 44 |
| 22 | | 54. 51. 49 | 56. 28. 32 | 58. 5. 18 | 59. 42. 5 |
| 23 | α Arietis. | 24. 15. 38 | 25. 54. 26 | 27. 33. 13 | 29. 12. 1 |
| 24 | | 37. 25. 4 | 39. 3. 21 | 40. 41. 28 | 42. 19. 26 |
| 30 | The Sun. | 48. 46. 41 | 49. 49. 2 | 51. 11. 17 | 52. 33. 27 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | The Sun. | 61. 35. 22 | 62. 58. 20 | 64. 21. 11 | 65. 43. 51 |
| 2 | | 72. 35. 19 | 73. 57. 15 | 75. 19. 7 | 76. 40. 54 |
| 3 | | 83. 28. 57 | 84. 50. 25 | 86. 11. 53 | 87. 33. 20 |
| 4 | | 94. 20. 57 | 95. 42. 34 | 97. 4. 14 | 98. 25. 59 |
| 5 | | 105. 16. 15 | 106. 38. 37 | 108. 1. 9 | 109. 23. 48 |
| 6 | | 116. 19. 41 | 117. 43. 24 | 119. 7. 21 | 120. 31. 30 |
| 4 | Regulus. | 22. 8. 13 | 23. 36. 35 | 25. 5. 4 | 26. 33. 42 |
| 5 | | 33. 58. 55 | 35. 28. 22 | 36. 57. 59 | 38. 27. 46 |
| 6 | | 45. 59. 26 | 47. 30. 21 | 49. 1. 31 | 50. 32. 52 |
| 7 | | 58. 13. 13 | 59. 46. 3 | 61. 19. 9 | 62. 52. 33 |
| 8 | Spica ♍ | 16. 51. 1 | 18. 24. 46 | 19. 59. 4 | 21. 33. 51 |
| 9 | | 29. 34. 9 | 31. 11. 21 | 32. 48. 54 | 34. 26. 49 |
| 10 | | 42. 41. 41 | 44. 21. 41 | 46. 2. 0 | 47. 42. 38 |
| 11 | | 56. 10. 29 | 57. 52. 56 | 59. 35. 39 | 61. 18. 40 |
| 12 | Antares. | 24. 7. 46 | 25. 52. 26 | 27. 37. 22 | 29. 22. 27 |
| 13 | | 38. 10. 55 | 39. 57. 7 | 41. 43. 27 | 43. 29. 56 |
| 14 | | 52. 24. 10 | 54. 11. 19 | 55. 58. 33 | 57. 45. 50 |
| 15 | | 66. 42. 53 | 68. 30. 25 | 70. 17. 56 | 72. 5. 28 |
| 16 | β Capri- | 26. 35. 47 | 28. 21. 31 | 30. 7. 24 | 31. 53. 23 |
| 17 | corni. | 40. 43. 50 | 42. 29. 56 | 44. 15. 58 | 46. 1. 59 |
| 18 | α Aquilæ. | 59. 37. 47 | 61. 5. 20 | 62. 33. 21 | 64. 1. 47 |
| 19 | | 71. 28. 50 | 72. 58. 56 | 74. 29. 11 | 75. 59. 32 |
| 20 | α Pegaſi. | 35. 47. 16 | 37. 20. 19 | 38. 54. 4 | 40. 28. 23 |
| 21 | | 48. 25. 54 | 50. 2. 11 | 51. 38. 36 | 53. 15. 9 |
| 22 | | 61. 18. 54 | 62. 55. 40 | 64. 32. 23 | 66. 9. 1 |
| 23 | α Arietis. | 30. 50. 46 | 32. 29. 29 | 34. 8. 6 | 35. 46. 38 |
| 29 | The Sun. | 42. 56. 10 | 44. 18. 58 | 45. 41. 39 | 47. 4. 13 |
| 30 | | 53. 55. 30 | 55. 17. 28 | 56. 39. 21 | 58. 1. 9 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | W. | |
| 2 | Th. | Viſitation of V. Mary. |
| 3 | F. | |
| 4 | Sa. | Tranſl. of S. Martin. |
| 5 | *Su.* | *3d. Sunday after Trinity.* |
| 6 | M. | In 3 Weeks of H. Trin. |
| 7 | Tu. | Cambridge Com. [4 ret. |
| 8 | W. | Term ends. |
| 9 | Th. | |
| 10 | F. | Cambridge Term ends. |
| 11 | Sa. | |
| 12 | *Su.* | *4th Sunday after Trinity.* |
| 13 | M. | Oxford Act. |
| 14 | Tu. | |
| 15 | W. | Swithin. |
| 16 | Th. | |
| 17 | F. | |
| 18 | Sa. | Oxford Term ends. |
| 19 | *Su.* | *5th Sunday after Trinity.* |
| 20 | M. | Margaret. |
| 21 | Tu. | |
| 22 | W. | Prs. Car. Matil. born |
| 23 | Th. | [1751. Magdalen. |
| 24 | F. | |
| 25 | Sa. | St. James. |
| 26 | *Su.* | *6th Sunday after Trinity.* |
| 27 | M. | [St. Anne. |
| 28 | Tu. | |
| 29 | W. | |
| 30 | Th. | |
| 31 | F. | |

## Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| First Quarter | 3. | 19. | 21 |
| Full Moon | 11. | 4. | 11 |
| Laſt Quarter | 17. | 19. | 39 |
| New Moon | 25. | 6. | 50 |

## Other Phenomena.

D.

2. ☋ ☊ ♋ at 7ʰ diff. Lat. 21′
6. ☿ ☌ ♌ at 21ʰ diff. Lat. 63′
7. ☾ ☍ ♏ 14ʰ 44′.
☾ ☌ ♏ at 23ʰ 34′
8. ☾ ☌ ♏ 3ʰ 4′
10. ☾ ☌ ♐ 1ʰ 26′
13. ☾ ☌ ♒ 23ʰ 28′
17. ☾ ☊ ♓ 16ʰ 39′
20. ☾ ☊ Pleiadum 2ʰ 53′
☿ ☍ ♌ at 3ʰ diff. Lat. 31′
♄ H ♊ diff. Lat. 50′
22. ☉ enters ♌ at 17ʰ 13′
☿ ☌ ♌ diff. Lat. 40′
23. ☾ ☌ ♊ 4ʰ 54′
25. ☉ eclipſed inviſible in *England:* begins at Sun-riſe in Lat. 19° 16′ ſouth, Long. 141° 45′ weſt of Greenwich: ends at Sun-ſet in Lat. 3° 23′ ſouth, Long. 60° 5′ weſt: centrally eclipſed in the Meridian in Lat. 1° 15′ ſouth.
29. ☾ ☋ ♌ 9ʰ 54′



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# JULY 1767.

| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declin. North. | Equat. of Time Add. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | W. | 3. 9. 17. 0 | 6. 40. 25 | 23. 8. 44 | 3. 14 | 12 |
| 2 | Th. | 3. 10. 14. 13 | 6. 44. 33 | 23. 4. 32 | 3. 26 | 11 |
| 3 | F. | 3. 11. 11. 25 | 6. 48. 41 | 22. 59. 56 | 3. 37 | 12 |
| 4 | Sa. | 3. 12. 8. 38 | 6. 52. 49 | 22. 54. 56 | 3. 49 | 10 |
| 5 | Su. | 3. 13. 5. 49 | 6. 56. 56 | 22. 49. 32 | 3. 59 | 10 |
| 6 | M. | 3. 14. 3. 1 | 7. 1. 3 | 22. 43. 44 | 4. 9 | 10 |
| 7 | Tu. | 3. 15. 0. 13 | 7. 5. 9 | 22. 37. 32 | 4. 19 | 10 |
| 8 | W. | 3. 15. 57. 24 | 7. 9. 15 | 22. 30. 57 | 4. 29 | 9 |
| 9 | Th. | 3. 16. 54. 36 | 7. 13. 21 | 22. 23. 59 | 4. 38 | 9 |
| 10 | F. | 3. 17. 51. 49 | 7. 17. 26 | 22. 16. 38 | 4. 47 | 8 |
| 11 | Sa. | 3. 18. 48. 59 | 7. 21. 31 | 22. 8. 53 | 4. 55 | 8 |
| 12 | Su. | 3. 19. 46. 11 | 7. 25. 36 | 22. 0. 45 | 5. 3 | 8 |
| 13 | M. | 3. 20. 43. 24 | 7. 29. 39 | 21. 52. 14 | 5. 11 | 7 |
| 14 | Tu. | 3. 21. 40. 37 | 7. 33. 43 | 21. 43. 23 | 5. 18 | 6 |
| 15 | W. | 3. 22. 37. 51 | 7. 37. 46 | 21. 34. 8 | 5. 24 | 6 |
| 16 | Th. | 3. 23. 35. 6 | 7. 41. 49 | 21. 24. 31 | 5. 30 | 6 |
| 17 | F. | 3. 24. 32. 21 | 7. 45. 51 | 21. 14. 32 | 5. 36 | 5 |
| 18 | Sa. | 3. 25. 29. 36 | 7. 49. 52 | 21. 4. 12 | 5. 41 | 5 |
| 19 | Su. | 3. 26. 26. 54 | 7. 53. 53 | 20. 53. 30 | 5. 46 | 4 |
| 20 | M. | 3. 27. 24. 12 | 7. 57. 54 | 20. 42. 27 | 5. 50 | 3 |
| 21 | Tu. | 3. 28. 21. 31 | 8. 1. 54 | 20. 31. 2 | 5. 53 | 3 |
| 22 | W. | 3. 29. 18. 51 | 8. 5. 54 | 20. 19. 17 | 5. 56 | 2 |
| 23 | Th. | 4. 0. 16. 12 | 8. 9. 52 | 20. 7. 11 | 5. 58 | 2 |
| 24 | F. | 4. 1. 13. 34 | 8. 13. 51 | 19. 54. 45 | 6. 0 | 1 |
| 25 | Sa. | 4. 2. 10. 56 | 8. 17. 49 | 19. 42. 0 | 6. 1 | 1 |
| 26 | Su. | 4. 3. 8. 19 | 8. 21. 46 | 19. 28. 54 | 6. 2 | 0 |
| 27 | M. | 4. 4. 5. 44 | 8. 25. 43 | 19. 15. 29 | 6. 2 | 0 |
| 28 | Tu. | 4. 5. 3. 8 | 8. 29. 39 | 19. 1. 45 | 6. 2 | 1 |
| 29 | W. | 4. 6. 0. 34 | 8. 33. 34 | 18. 47. 42 | 6. 1 | 2 |
| 30 | Th. | 4. 6. 58. 0 | 8. 37. 29 | 18. 33. 20 | 5. 59 | 3 |
| 31 | F. | 4. 7. 55. 27 | 8. 41. 23 | 18. 18. 41 | 5. 56 | 3 |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | s ° ′ |
| 1 | 15. 46, 9 | 1. 8, 7 | 2. 23, 0 | 0, 007244 | 10. 1. 53 |
| 7 | 15. 47, 0 | 1. 8, 4 | 2. 23, 0 | 0, 007182 | 10. 1. 34 |
| 13 | 15. 47, 2 | 1. 8, 0 | 2. 23, 1 | 0, 007066 | 10. 1. 15 |
| 19 | 15. 47, 6 | 1. 7, 6 | 2. 23, 2 | 0, 006894 | 10. 0. 56 |
| 25 | 15. 48, 2 | 1. 7, 2 | 2. 23, 4 | 0, 006653 | 10. 0. 37 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Emerſions. | | II. Satellite. Emerſions. | | III. Satellite. | | |
|---|---|---|---|---|---|---|
| Days | h ′ ″ | Days | h ′ ″ | Days | h ′ ″ | |
| 1 | 11. 45. 39 | 1 | 8*47. 1 | 2 | 18. 56. 14 | I |
| 3 | 6. 13. 56 | 4 | 22. 4. 55 | 2 | 21. 52. 24 | E |
| 5 | 0. 42. 13 | 8 | 11. 22. 55 | 9 | 22. 54. 25 | I |
| 6 | 19. 10. 35 | 12 | 0. 41. 1 | 10 | 1. 49. 37 | E |
| 8 | 13. 38. 51 | 15 | 13. 59. 14 | 17 | 2. 52. 56 | I |
| 10 | 8. 7. 12 | 19 | 3. 17. 29 | 17 | 5. 47. 10 | E |
| 12 | 2. 35. 37 | 22 | 16. 35. 51 | 24 | 6. 51. 47 | I |
| 13 | 21. 3. 58 | 26 | 5. 54. 26 | 24 | 9. 45. 1 | E |
| 15 | 15. 32. 23 | 29 | 19. 13. 0 | 31 | 10. 51. 11 | I |
| 17 | 10. *0. 50 | | | 31 | 13. 43. 23 | E |
| 19 | 4. 29. 17 | | | IV. Satellite. | | |
| 20 | 22. 57. 44 | | | 11 | 23. 12. 51 | I |
| 22 | 17. 26. 16 | | | 12 | 2. 4. 47 | E |
| 24 | 11. 54. 48 | | | 28 | 17. 12. 43 | I |
| 26 | 6. 23. 19 | | | 28 | 19. 56. 45 | E |
| 28 | 0. 51. 51 | | | | | |
| 29 | 19. 20. 33 | | | | | |
| 31 | 13. 49. 8 | | | | | |



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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Paſſage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | MERCURY. greateſt Elong. 29d | | | | | |
| 1 | 4. 29. 30 | 6. 47 N | 3. 21. 31 | 1. 53 N | 23. 36 N | 0. 54 |
| 7 | 5. 25. 59 | 5. 21 | 4. 2. 42 | 1. 43 | 21. 16 | 1. 16 |
| 13 | 6. 18. 4 | 3. 15 | 4. 12. 42 | 1. 13 | 18. 11 | 1. 32 |
| 19 | 7. 7. 14 | 1. 2 | 4. 21. 31 | 0. 27 | 14. 47 | 1. 42 |
| 25 | 7. 24 39 | 1. 5 S | 4. 29. 3 | 0. 32 S | 11. 19 | 1. 46 |
| | VENUS. | | | | | |
| 1 | 6. 26. 38 | 2. 31 N | 4. 19. 57 | 1. 43 N | 16. 28 N | 2. 51 |
| 7 | 7. 6. 15 | 2. 6 | 4. 26. 45 | 1. 30 | 14. 1 | 2. 53 |
| 13 | 7. 15. 50 | 1. 38 | 5. 3. 28 | 1. 13 | 11. 23 | 2. 54 |
| 19 | 7. 25. 25 | 1. 7 | 5. 10. 5 | 0. 53 | 8. 37 | 2. 54 |
| 25 | 8. 4. 58 | 0. 34 | 5. 16. 36 | 0. 28 | 5. 44 | 2. 54 |
| | MARS. | | | | | |
| 1 | 4. 14. 41 | 1. 51 N | 4. 1. 21 | 1. 12 N | 21. 3 N | 1. 35 |
| 7 | 4. 17. 20 | 1. 51 | 4. 5. 9 | 1. 11 | 20. 9 | 1. 26 |
| 13 | 4. 19. 58 | 1. 51 | 4. 8. 56 | 1. 11 | 19. 11 | 1. 17 |
| 19 | 4. 22. 36 | 1. 51 | 4. 12. 44 | 1. 10 | 18. 8 | 1. 8 |
| 25 | 4. 25. 13 | 1. 50 | 4. 16. 32 | 1. 10 | 17. 1 | 1. 0 |
| | JUPITER. | | | | | |
| 1 | 5. 26. 48 | 1. 18 N | 5. 16. 51 | 1. 13 N | 6. 19 N | 4. 32 |
| 7 | 5. 27. 15 | 1. 18 | 5. 17. 42 | 1. 12 | 5. 58 | 4. 11 |
| 13 | 5. 27. 42 | 1. 18 | 5. 18. 36 | 1. 12 | 5. 38 | 3. 50 |
| 19 | 5. 28. 9 | 1. 18 | 5. 19. 34 | 1. 11 | 5. 12 | 3. 29 |
| 25 | 5. 28. 37 | 1. 18 | 5. 20. 36 | 1. 10 | 4. 50 | 3. 9 |
| | SATURN. | | | | | |
| 1 | 2. 23. 47 | 1. 10 S | 2. 25. 21 | 1. 3 S | 22. 20 N | 22. 56 |
| 7 | 2. 24. 1 | 1. 9 | 2. 26. 7 | 1. 3 | 22. 22 | 22. 35 |
| 13 | 2. 24. 14 | 1. 9 | 2. 26. 52 | 1. 2 | 22. 24 | 22. 14 |
| 19 | 2. 24. 28 | 1. 8 | 2. 27. 35 | 1. 2 | 22. 25 | 21. 53 |
| 25 | 2. 24. 42 | 1. 8 | 2. 28. 18 | 1. 2 | 22. 26 | 21. 32 |

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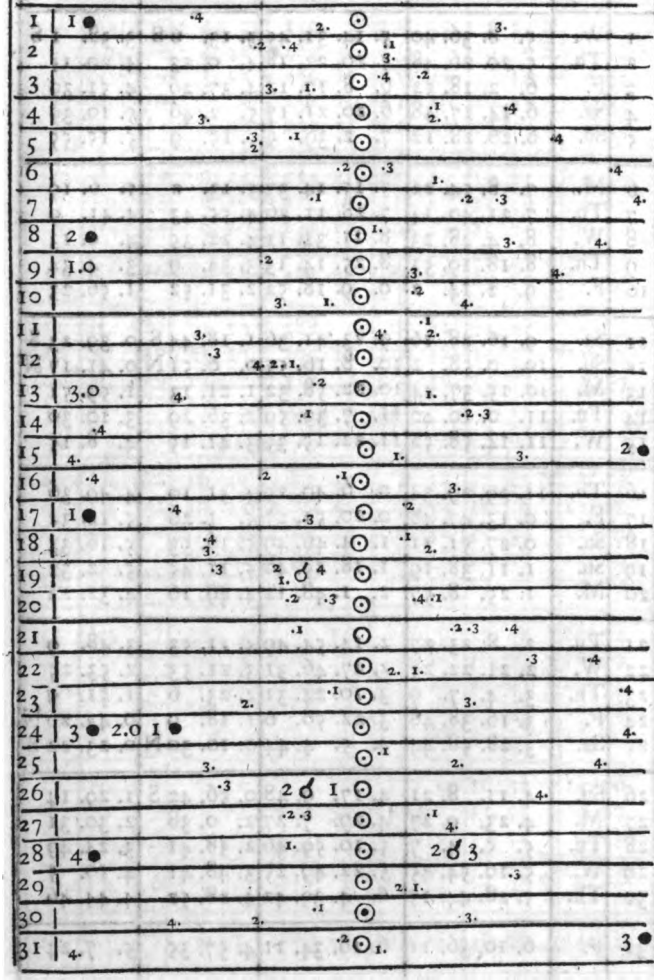
## Configurations of the SATELLITES of JUPITER at 9 o' th' Clock in the Evening.

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| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | W. | 5. 8. 36. 40 | 5. 14. 31. 45 | 3. 13. 6 S | 3. 38. 1 S |
| 2 | Th. | 5. 20. 26. 48 | 5. 26. 22. 18 | 4. 0. 23 | 4. 20. 15 |
| 3 | F. | 6. 2. 18. 54 | 6. 8. 17. 12 | 4. 37. 26 | 4. 51. 39 |
| 4 | Sa. | 6. 14. 17. 48 | 6. 20. 21. 17 | 5. 2. 46 | 5. 10. 39 |
| 5 | Su. | 6. 26. 28. 12 | 7. 2. 39. 5 | 5. 15. 9 | 5. 15. 55 |
| 6 | M. | 7. 8. 54. 22 | 7. 15. 14. 37 | 5. 13. 2 | 5. 6. 19 |
| 7 | Tu. | 7. 21. 40. 14 | 7. 28. 11. 26 | 4. 55. 43 | 4. 41. 9 |
| 8 | W. | 8. 4. 48. 23 | 8. 11. 31. 11 | 4. 22. 35 | 4. 0. 13 |
| 9 | Th. | 8. 18. 19. 51 | 8. 25. 14. 13 | 3. 34. 9 | 3. 4. 34 |
| 10 | F. | 9. 2. 14. 2 | 9. 9. 18. 52 | 2. 31. 52 | 1. 56. 23 |
| 11 | Sa. | 9. 16. 28. 16 | 9. 23. 41. 36 | 1. 18. 44 S | 0. 39. 23 S |
| 12 | Su. | 10. 0. 58. 2 | 10. 8. 16. 55 | 0. 0. 51 N | 0. 41. 17 N |
| 13 | M. | 10. 15. 37. 24 | 10. 22. 58. 32 | 1. 21. 13 | 1. 59. 51 |
| 14 | Tu. | 11. 0. 19. 40 | 11. 7. 39. 59 | 2. 36. 29 | 3. 10. 30 |
| 15 | W. | 11. 14. 58. 52 | 11. 22. 15. 35 | 3. 41. 15 | 4. 8. 15 |
| 16 | Th. | 11. 29. 29. 34 | 0. 6. 40. 25 | 4. 31. 10 | 4. 49. 36 |
| 17 | F. | 0. 13. 47. 48 | 0. 20. 51. 27 | 5. 3. 26 | 5. 12. 32 |
| 18 | Sa. | 0. 27. 51. 11 | 1. 4. 46. 49 | 5. 16. 53 | 5. 16. 33 |
| 19 | Su. | 1. 11. 38. 19 | 1. 18. 25. 40 | 5. 11. 45 | 5. 2. 32 |
| 20 | M. | 1. 25. 8. 57 | 2. 1. 48. 12 | 4. 49. 16 | 4. 32. 22 |
| 21 | Tu. | 2. 8. 23. 27 | 2. 14. 54. 49 | 4. 11. 53 | 3. 48. 9 |
| 22 | W. | 2. 21. 22. 27 | 2. 27. 46. 31 | 3. 21. 53 | 2. 53. 25 |
| 23 | Th. | 3. 4. 7. 9 | 3. 10. 24. 31 | 2. 23. 6 | 1. 51. 9 |
| 24 | F. | 3. 16. 38. 46 | 3. 22. 50. 6 | 1. 18. 9 | 0. 44. 26 N |
| 25 | Sa. | 3. 28. 58. 44 | 4. 5. 4. 44 | 0. 10. 30 N | 0. 23. 22 S |
| 26 | Su. | 4. 11. 8. 21 | 4. 17. 9. 48 | 0. 56. 42 S | 1. 29. 14 |
| 27 | M. | 4. 23. 9. 27 | 4. 29. 7. 27 | 2. 0. 38 | 2. 30. 31 |
| 28 | Tu. | 5. 5. 4. 7 | 5. 10. 59. 46 | 2. 58. 41 | 3. 24. 49 |
| 29 | W. | 5. 16. 54. 45 | 5. 22. 49. 25 | 3. 48. 41 | 4. 10. 5 |
| 30 | Th. | 5. 28. 44. 17 | 6. 4. 39. 42 | 4. 28. 52 | 4. 44. 46 |
| 31 | F. | 6. 10. 36. 11 | 6. 16. 34. 11 | 4. 57. 35 | 5. 7. 24 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Paſſage over Merid. | ☽'s Right Aſcen. at Noon. | ☽'s Right Aſc. at Midn. | ☽'s Declinat. at Noon. | ☽'s Declin. at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h / | ° / | ° / | ° / | ° / |
| 1 | W. | 7 | 4. 2 | 159. 2 | 164. 21 | 5. 22 N | 2. 45 N |
| 2 | Th. | 8 | 4. 42 | 169. 39 | 174. 57 | 0. 6 S | 2. 32 S |
| 3 | F. | 9 | 5. 22 | 180. 17 | 185. 41 | 5. 10 | 7. 45 |
| 4 | Sa. | 10 | 6. 3 | 191. 10 | 196. 48 | 10. 17 | 12. 45 |
| 5 | Su. | 11 | 6. 46 | 202. 35 | 208. 33 | 15. 7 | 17. 21 |
| 6 | M. | 12 | 7. 34 | 214. 45 | 221. 10 | 19. 25 | 21. 18 |
| 7 | Tu. | 13 | 8. 25 | 227. 51 | 234. 47 | 22. 56 | 24. 21 |
| 8 | W. | 14 | 9. 20 | 241. 58 | 249. 23 | 25. 25 | 26. 10 |
| 9 | Th. | 15 | 10. 19 | 256. 58 | 264. 41 | 26. 31 | 26. 27 |
| 10 | F. | 16 | 11. 19 | 272. 29 | 280. 17 | 25. 59 | 25. 5 |
| 11 | Sa. | 17 | 12. 19 | 288. 2 | 295. 41 | 23. 45 | 22. 2 |
| 12 | Su. | 18 | 13. 16 | 303. 12 | 310. 32 | 19. 57 | 17. 33 |
| 13 | M. | 19 | 14. 10 | 317. 41 | 324. 39 | 14. 52 | 11. 57 |
| 14 | Tu. | 20 | 15. 3 | 331. 29 | 338. 10 | 8. 55 | 5. 45 S |
| 15 | W. | 21 | 15. 53 | 344. 44 | 351. 15 | 2. 31 S | 0. 44 N |
| 16 | Th. | 22 | 16. 43 | 357. 44 | 4. 12 | 3. 57 N | 7. 5 |
| 17 | F. | 23 | 17. 33 | 10. 42 | 17. 16 | 10. 6 | 12. 58 |
| 18 | Sa. | 24 | 18. 25 | 23. 54 | 30. 38 | 15. 39 | 18. 6 |
| 19 | Su. | 25 | 19. 18 | 37. 29 | 44. 27 | 20. 17 | 22. 10 |
| 20 | M. | 26 | 20. 13 | 51. 32 | 58. 41 | 23. 45 | 24. 59 |
| 21 | Tu. | 27 | 21. 9 | 65. 54 | 73. 9 | 25. 52 | 26. 24 |
| 22 | W. | 28 | 22. 3 | 80. 22 | 87. 31 | 26. 33 | 26. 20 |
| 23 | Th. | 29 | 22. 55 | 94. 34 | 101. 29 | 25. 47 | 24. 54 |
| 24 | F. | 30 | 23. 45 | 108. 14 | 114. 48 | 23. 43 | 22. 16 |
| 25 | Sa. | 1 | ♂ | 121. 10 | 127. 20 | 20. 34 | 18. 39 |
| 26 | Su. | 2 | 0. 31 | 133. 20 | 139. 9 | 16. 32 | 14. 18 |
| 27 | M. | 3 | 1. 13 | 144. 50 | 150. 22 | 11. 55 | 9. 27 |
| 28 | Tu. | 4 | 1. 56 | 155. 48 | 161. 10 | 6. 54 | 4. 18 N |
| 29 | W. | 5 | 2. 37 | 166. 29 | 171. 46 | 1. 40 N | 0. 59 S |
| 30 | Th. | 6 | 3. 16 | 177. 3 | 182. 23 | 3. 36 S | 6. 13 |
| 31 | F. | 7 | 3. 57 | 187. 46 | 193. 15 | 8. 46 | 11. 15 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | W. | 14. 49 | 14. 48 | 54. 21 | 54. 19 | 0430 | 0432 |
| 2 | Th. | 14. 48 | 14. 49 | 54. 20 | 54. 24 | 0431 | 0426 |
| 3 | F. | 14. 51 | 14. 53 | 54. 29 | 54. 38 | 0419 | 0407 |
| 4 | Sa. | 14. 56 | 15. 0 | 54. 49 | 55. 2 | 0392 | 0375 |
| 5 | Su. | 15. 4 | 15. 9 | 55. 18 | 55. 37 | 0354 | 0329 |
| 6 | M. | 15. 15 | 15. 21 | 55. 57 | 56. 19 | 0304 | 0275 |
| 7 | Tu. | 15. 27 | 15. 34 | 56. 43 | 57. 8 | 0244 | 0213 |
| 8 | W. | 15. 41 | 15. 48 | 57. 33 | 57. 59 | 0181 | 0148 |
| 9 | Th. | 15. 55 | 16. 1 | 58. 24 | 58. 48 | 0117 | 0088 |
| 10 | F. | 16. 8 | 16. 13 | 59. 11 | 59. 32 | 0060 | 0034 |
| 11 | Sa. | 16. 18 | 16. 22 | 59. 50 | 60. 5 | 0012 | 9994 |
| 12 | Su. | 16. 25 | 16. 28 | 60. 17 | 60. 25 | 9980 | 9970 |
| 13 | M. | 16. 29 | 16. 29 | 60. 30 | 60. 31 | 9964 | 9963 |
| 14 | Tu. | 16. 29 | 16. 27 | 60. 29 | 60. 23 | 9965 | 9972 |
| 15 | W. | 16. 25 | 16. 22 | 60. 15 | 60. 4 | 9982 | 9995 |
| 16 | Th. | 16. 18 | 16. 14 | 59. 51 | 59. 36 | 0011 | 0029 |
| 17 | F. | 16. 10 | 16. 6 | 59. 20 | 59. 3 | 0049 | 0069 |
| 18 | Sa. | 16. 0 | 15. 56 | 58. 46 | 58. 27 | 0090 | 0114 |
| 19 | Su. | 15. 51 | 15. 46 | 58. 10 | 57. 52 | 0135 | 0157 |
| 20 | M. | 15. 41 | 15. 37 | 57. 35 | 57. 18 | 0179 | 0200 |
| 21 | Tu. | 15. 32 | 15. 28 | 57. 1 | 56. 45 | 0221 | 0242 |
| 22 | W. | 15. 23 | 15. 19 | 56. 28 | 56. 13 | 0264 | 0283 |
| 23 | Th. | 15. 15 | 15. 11 | 55. 59 | 55. 44 | 0301 | 0320 |
| 24 | F. | 15. 8 | 15. 4 | 55. 32 | 55. 19 | 0336 | 0353 |
| 25 | Sa. | 15. 1 | 14. 58 | 55. 7 | 54. 55 | 0369 | 0384 |
| 26 | Su. | 14. 56 | 14. 53 | 54. 46 | 54. 36 | 0396 | 0410 |
| 27 | M. | 14. 50 | 14. 49 | 54. 28 | 54. 21 | 0420 | 0430 |
| 28 | Tu. | 14. 47 | 14. 46 | 54. 16 | 54. 12 | 0436 | 0442 |
| 29 | W. | 14. 46 | 14. 46 | 54. 10 | 54. 11 | 0444 | 0443 |
| 30 | Th. | 14. 46 | 14. 47 | 54. 13 | 54. 17 | 0440 | 0435 |
| 31 | F. | 14. 49 | 14. 52 | 54. 23 | 54. 32 | 0427 | 0415 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 41. 57. 50 | 40. 29. 14 | 39. 0. 42 | 37. 32. 14 |
| 2 | Spica ♍ | 30. 10. 43 | 28. 42. 31 | 27. 14. 21 | 25. 46. 14 |
| 3 | | 18. 26. 24 | 16. 58. 43 | 15. 31. 12 | 14. 3. 53 |
| 4 | Antares. | 52. 2. 13 | 50. 31. 58 | 49. 1. 31 | 47. 30. 54 |
| 5 | | 39. 54. 40 | 38. 22. 45 | 36. 50. 32 | 35. 18. 5 |
| 6 | α Aquilæ. | 83. 33. 15 | 82. 11. 23 | 80. 49. 18 | 79. 27. 3 |
| 7 | | 72. 33. 33 | 71. 10. 32 | 69. 47. 27 | 68. 24. 19 |
| 8 | β Capricorni. | 56. 39. 50 | 55. 0. 19 | 53. 20. 25 | 51. 40. 9 |
| 9 | | 43. 13. 21 | 41. 30. 54 | 39. 48. 8 | 38. 5. 5 |
| 10 | | 79. 34. 45 | 77. 52. 39 | 76. 10. 19 | 74. 27. 45 |
| 11 | α Pegasi. | 65. 51. 48 | 64. 8. 7 | 62. 24. 23 | 60. 40. 34 |
| 12 | | 52. 1. 46 | 50. 18. 21 | 48. 35. 9 | 46. 52. 12 |
| 13 | | 38. 24. 9 | 36. 44. 29 | 35. 5. 45 | 33. 28. 4 |
| 14 | α Arietis. | 64. 2. 15 | 62. 12. 17 | 60. 22. 27 | 58. 32. 44 |
| 15 | | 49. 26. 20 | 47. 37. 35 | 45. 49. 2 | 44. 0. 42 |
| 16 | Aldebaran. | 67. 42. 9 | 65. 56. 11 | 64. 10. 31 | 62. 25. 9 |
| 17 | | 53. 42. 56 | 51. 59. 30 | 50. 16. 22 | 48. 33. 36 |
| 16 | | 114. 0. 49 | 112. 20. 10 | 110. 39. 43 | 108. 59. 30 |
| 17 | | 100. 42. 5 | 99. 3. 21 | 97. 24. 50 | 95. 46. 35 |
| 18 | The Sun. | 87. 39. 7 | 86. 2. 23 | 84. 25. 53 | 82. 49. 40 |
| 19 | | 74. 52. 26 | 73. 17. 44 | 71. 43. 17 | 70. 9. 5 |
| 20 | | 62. 21. 40 | 60. 48. 55 | 59. 16. 23 | 57. 44. 2 |
| 21 | | 50. 5. 46 | 48. 34. 48 | 47. 4. 4 | 45. 33. 32 |
| 27 | | 57. 24. 25 | 55. 54. 43 | 54. 25. 7 | 52. 55. 39 |
| 28 | Spica ♍ | 45. 29. 56 | 44. 1. 5 | 42. 32. 18 | 41. 3. 36 |
| 29 | | 33. 41. 26 | 32. 13. 14 | 30. 45. 6 | 29. 17. 3 |
| 30 | | 21. 57. 49 | 20. 30. 13 | 19. 2. 46 | 17. 35. 29 |
| 31 | Antares. | 55. 43. 1 | 54. 14. 3 | 52. 44. 56 | 51. 15. 43 |



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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Spica ♍ | 36. 3. 49 | 34. 35. 29 | 33. 7. 11 | 31. 38. 56 |
| 2 | | 24. 18. 8 | 22. 50. 4 | 21. 22. 5 | 19. 54. 11 |
| 3 | Antares. | 58. 1. 35 | 56. 32. 0 | 55. 2. 14 | 53. 32. 19 |
| 4 | | 46. 0. 4 | 44. 29. 4 | 42. 57. 49 | 41. 26. 22 |
| 5 | | 33. 45. 20 | 32. 12. 18 | 30. 38. 59 | 29. 5. 25 |
| 6 | α Aquilæ | 78. 4. 37 | 76. 42. 2 | 75. 19. 19 | 73. 56. 30 |
| 7 | | 67. 1. 9 | 65. 38. 0 | 64. 14. 56 | 62. 51. 58 |
| 8 | β Capricorni. | 49. 59. 30 | 48. 18. 29 | 46. 37. 7 | 44. 55. 25 |
| 9 | | 36. 21. 43 | 34. 38. 3 | 32. 54. 12 | 31. 10. 11 |
| 10 | α Pegasi. | 72. 44. 57 | 71. 1. 55 | 69. 18. 42 | 67. 35. 20 |
| 11 | | 58. 56. 41 | 57. 12. 49 | 55. 29. 1 | 53. 45. 21 |
| 12 | | 45. 9. 36 | 43. 27. 26 | 41. 45. 45 | 40. 4. 37 |
| 13 | | 31. 51. 40 | 30. 16. 44 | 28. 43. 32 | 27. 12. 20 |
| 14 | α Arietis. | 56. 43. 8 | 54. 53. 41 | 53. 4. 24 | 51. 15. 17 |
| 15 | | 42. 12. 34 | 40. 24. 41 | 38. 37. 2 | 36. 49. 38 |
| 16 | Aldebaran. | 60. 40. 5 | 58. 55. 18 | 57. 10. 50 | 55. 26. 42 |
| 17 | | 46. 51. 15 | 45. 9. 20 | 43. 27. 50 | 41. 46. 47 |
| 15 | The Sun. | 120. 45. 32 | 119. 4. 3 | 117. 22. 47 | 115. 41. 42 |
| 16 | | 107. 19. 29 | 105. 39. 46 | 104. 0. 17 | 102. 21. 4 |
| 17 | | 94. 8. 35 | 92. 30. 49 | 90. 53. 19 | 89. 16. 5 |
| 18 | | 81. 13. 41 | 79. 37. 59 | 78. 2. 33 | 76. 27. 22 |
| 19 | | 68. 35. 8 | 67. 1. 25 | 65. 27. 56 | 63. 54. 41 |
| 20 | | 56. 11. 53 | 54. 40. 1 | 53. 8. 22 | 51. 36. 57 |
| 21 | | 44. 3. 13 | 42. 33. 7 | 41. 3. 13 | |
| 27 | Spica ♍ | 51. 26. 17 | 49. 57. 3 | 48. 27. 55 | 46. 58. 53 |
| 28 | | 39. 35. 1 | 38. 6. 30 | 36. 38. 4 | 35. 9. 43 |
| 29 | | 27. 49. 4 | 26. 21. 7 | 24. 53. 15 | 23. 25. 30 |
| 30 | | 16. 8. 26 | 14. 41. 42 | 13. 15. 23 | 11. 49. 26 |
| 31 | Antares. | 49. 46. 20 | 48. 16. 50 | 46. 47. 13 | 45. 17. 26 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | The Sun. | 59. 22. 49 | 60. 44. 32 | 62. 6. 12 | 63. 27. 49 |
| 2 | | 70. 15. 32 | 71. 37. 6 | 72. 58. 41 | 74. 20. 19 |
| 3 | | 81. 9. 9 | 82. 31. 11 | 83. 53. 19 | 85. 15. 34 |
| 4 | | 92. 8. 36 | 93. 31. 42 | 94. 54. 59 | 96. 18. 28 |
| 5 | | 103. 18. 56 | 104. 43. 44 | 106. 8. 47 | 107. 34. 6 |
| 6 | | 114. 44. 42 | 116. 11. 44 | 117. 39. 7 | 119. 6. 50 |
| 4 | Regulus. | 47. 57. 17 | 49. 27. 22 | 50. 57. 38 | 52. 28. 5 |
| 5 | | 60. 3. 36 | 61. 35. 24 | 63. 7. 28 | 64. 39. 47 |
| 6 | Spica ♍ | 18. 32. 12 | 20. 5. 11 | 21. 38. 37 | 23. 12. 27 |
| 7 | | 31. 8. 22 | 32. 44. 48 | 34. 21. 40 | 35. 58. 55 |
| 8 | | 44. 11. 15 | 45. 50. 57 | 47. 31. 4 | 49. 11. 35 |
| 9 | | 57. 40. 13 | 59. 23. 7 | 61. 6. 25 | 62. 50. 4 |
| 10 | Antares. | 25. 44. 3 | 27. 30. 7 | 29. 16. 28 | 31. 3. 6 |
| 11 | | 40. 0. 53 | 41. 49. 17 | 43. 37. 56 | 45. 26. 49 |
| 12 | | 54. 34. 12 | 56. 24. 12 | 58. 14. 19 | 60. 4. 33 |
| 13 | β Capricorni. | 15. 8. 41 | 16. 54. 40 | 18. 41. 25 | 20. 28. 49 |
| 14 | | 29. 31. 26 | 31. 20. 26 | 33. 9. 29 | 34. 58. 34 |
| 15 | α Aquilæ | 50. 53. 43 | 52. 19. 5 | 53. 45. 18 | 55. 12. 17 |
| 16 | | 62. 36. 7 | 64. 6. 13 | 65. 36. 37 | 67. 7. 16 |
| 17 | α Pegaſi. | 27. 3. 0 | 28. 30. 19 | 29. 59. 4 | 31. 29. 6 |
| 18 | | 39. 13. 8 | 40. 47. 46 | 42. 22. 46 | 43. 58. 5 |
| 19 | | 51. 57. 1 | 53. 33. 3 | 55. 9. 6 | 56. 45. 8 |
| 20 | | 64. 44. 20 | 66. 19. 56 | 67. 55. 25 | 69. 30. 47 |
| 21 | α Arietis. | 34. 10. 47 | 35. 47. 57 | 37. 24. 56 | 39. 1. 46 |
| 22 | | 47. 3. 27 | 48. 39. 18 | 50. 14. 59 | 51. 50. 30 |
| 23 | Aldebaran | 28. 38. 30 | 30. 7. 44 | 31. 37. 11 | 33. 6. 50 |
| 29 | The Sun. | 41. 2. 55 | 42. 24. 26 | 43. 45. 56 | 45. 7. 23 |
| 30 | | 51. 54. 31 | 53. 15. 59 | 54. 37. 28 | 55. 59. 0 |
| 31 | | 62. 47. 23 | 64. 9. 14 | 65. 31. 10 | 66. 53. 13 |



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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 64. 49. 24 | 66. 10. 56 | 67. 32. 28 | 68. 54. 0 |
| 2 | | 75. 41. 59 | 77. 3. 40 | 78. 25. 25 | 79. 47. 15 |
| 3 | The Sun. | 86. 37. 55 | 88. 0. 22 | 89. 22. 58 | 90. 45. 42 |
| 4 | | 97. 42. 9 | 99. 6. 1 | 100. 30. 6 | 101. 54. 24 |
| 5 | | 108. 59. 40 | 110. 25. 29 | 111. 51. 35 | 113. 18. 0 |
| 6 | | 120. 34. 55 | | | |
| 4 | Regulus. | 53. 58. 45 | 55. 29. 38 | 57. 0. 45 | 58. 32. 4 |
| 5 | | 66. 12. 23 | 67. 45. 15 | 69. 18. 24 | 70. 51. 51 |
| 6 | | 24. 46. 44 | 26. 21. 29 | 27. 56. 42 | 29. 32. 18 |
| 7 | Spica ♍ | 37. 36. 36 | 39. 14. 38 | 40. 53. 6 | 42. 31. 57 |
| 8 | | 50. 52. 32 | 52. 33. 52 | 54. 15. 35 | 55. 57. 42 |
| 9 | | 64. 34. 7 | 66. 18. 32 | 68. 3. 17 | 69. 48. 25 |
| 10 | | 32. 50. 2 | 34. 37. 19 | 36. 24. 53 | 38. 12. 45 |
| 11 | Antares. | 47. 15. 56 | 49. 5. 14 | 50. 54. 43 | 52. 44. 22 |
| 12 | | 61. 54. 55 | 63. 45. 23 | 65. 35. 54 | 67. 26. 30 |
| 13 | β Capri- | 22. 16. 45 | 24. 5. 3 | 25. 53. 40 | 27. 42. 29 |
| 14 | corni. | 36. 47. 40 | 38. 36. 46 | 40. 25. 50 | 42. 14. 51 |
| 15 | α Aquilæ. | 56. 39. 57 | 58. 8. 12 | 59. 37. 4 | 61. 6. 23 |
| 16 | | 68. 38. 8 | 70. 9. 8 | 71. 40. 15 | 73. 11. 27 |
| 17 | | 33. 0. 14 | 34. 32. 20 | 36. 5. 17 | 37. 38. 55 |
| 18 | α Pegaſi. | 45. 33. 38 | 47. 9. 19 | 48. 45. 8 | 50. 21. 2 |
| 19 | | 58. 21. 8 | 59. 57. 3 | 61. 32. 53 | 63. 8. 39 |
| 20 | | 71. 6. 2 | 72. 41. 8 | 74. 16. 4 | 75. 50. 50 |
| 21 | α Arietis. | 40. 38. 26 | 42. 14. 56 | 43. 51. 16 | 45. 27. 26 |
| 22 | | 53. 25. 51 | 55. 1. 2 | 56. 36. 1 | 58. 10. 49 |
| 23 | Aldebaran | 34. 36. 41 | 36. 6. 43 | 37. 36. 52 | 39. 7. 3 |
| 29 | | 46. 28. 48 | 47. 50. 12 | 49. 11. 36 | 50. 33. 3 |
| 30 | The Sun. | 57. 20. 35 | 58. 42. 12 | 60. 3. 52 | 61. 25. 36 |
| 31 | | 68. 15. 23 | 69. 37. 43 | 71. 0. 12 | 72. 22. 49 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | Sa. | Lammas Day. |
| 2 | *Su.* | *7th Sunday after Trinity.* |
| 3 | M. | |
| 4 | Tu. | |
| 5 | W. | |
| 6 | Th. | Transfigur. of our Lord. |
| 7 | F. | Name of Jesus. |
| 8 | Sa. | |
| 9 | *Su.* | *8th Sunday after Trinity.* |
| 10 | M. | St. Lawrence. |
| 11 | Tu. | Prs. of Brunswick born. |
| 12 | W. | Pr. of Wales born 1762. |
| 13 | Th. | |
| 14 | F. | |
| 15 | Sa. | |
| 16 | *Su.* | *9th Sun. after Trin.* Pr. |
| 17 | M. | [Fred. born. |
| 18 | Tu. | |
| 19 | W. | |
| 20 | Th. | |
| 21 | F. | Pr. William Hen. born. |
| 22 | Sa. | |
| 23 | *Su.* | *10th Sunday after Trinity.* |
| 24 | M. | St. Bartholomew. |
| 25 | Tu. | |
| 26 | W. | |
| 27 | Th. | |
| 28 | F. | St. Auguſtine. |
| 29 | Sa. | Beheading of St. John Bt. |
| 30 | *Su.* | *11th Sunday after Trinity.* |
| 31 | M. | |

Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| First Quarter — | 2. | 10. | 49 |
| Full Moon —— | 9. | 12. | 11 |
| Laſt Quarter — | 16. | 2. | 33 |
| New Moon —— | 23. | 22. | 6 |

Other Phenomena.

D.

3. ☾ ☍ ♏ 23h. 47′.
4. ☾ ☌ ♏ 8h. 47′.
☾ ☌ ♏ 12h. 23′
6. ☾ ☍ ♐ 11h. 34′.
9. ♂ ☌ ♌ diff. Lat. 40′.
10. ☾ ☌ ♒ 8h. 5′.
11. ♄ ☍ □ diff. Lat. 7′
♃ ☌ ♍ diff. Lat. 26′.
13. ☾ ☍ ♓ 23h. 20′.
16. ☾ ☍ Pleiadum 8h. 32.
19. ☾ ☌ ♊ 10h. 45′
21. ☾ ☌ ☋ 19h. 1′.
22. ☉ enters ♍ at 23h. 26′.
25. ☾ ☌ ♌ 16h. 15′.
28. ♀ ☌ ♍ diff. Lat. 51′.
29. ☿ ☌ ♍ diff. Lat. 17′.
31. ☾ ☍ ♏ 7h 33′.
☾ ☌ ♏ 16h. 47′.
☾ ☌ ♐ 20h. 28′.

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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declination North. | Equat. of Time Add. | Diff. |
|---|---|---|---|---|---|---|
| | | ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | Sa. | 4. 8. 52. 54 | 8. 45. 16 | 18. 3. 43 | 5. 53 | 3 |
| 2 | Su. | 4. 9. 50. 21 | 8. 49. 8 | 17. 48. 27 | 5. 50 | 5 |
| 3 | M. | 4. 10. 47. 50 | 8. 53. 1 | 17. 32. 55 | 5. 45 | 5 |
| 4 | Tu. | 4. 11. 45. 19 | 8. 56. 53 | 17. 17. 5 | 5. 40 | 5 |
| 5 | W. | 4. 12. 42. 49 | 9. 0. 44 | 17. 0. 58 | 5. 35 | 7 |
| 6 | Th. | 4. 13. 40. 20 | 9. 4. 34 | 16. 44. 35 | 5. 28 | 6 |
| 7 | F. | 4. 14. 37. 52 | 9. 8. 24 | 16. 27. 56 | 5. 22 | 8 |
| 8 | Sa. | 4. 15. 35. 24 | 9. 12. 14 | 16. 11. 1 | 5. 14 | 7 |
| 9 | Su. | 4. 16. 32. 57 | 9. 16. 3 | 15. 53. 50 | 5. 7 | 9 |
| 10 | M. | 4. 17. 30. 32 | 9. 19. 52 | 15. 36. 24 | 4. 58 | 9 |
| 11 | Tu. | 4. 18. 28. 8 | 9. 23. 39 | 15. 18. 43 | 4. 49 | 9 |
| 12 | W. | 4. 19. 25. 45 | 9. 27. 26 | 15. 0. 47 | 4. 40 | 10 |
| 13 | Th. | 4. 20. 23. 24 | 9. 31. 11 | 14. 42. 37 | 4. 30 | 11 |
| 14 | F. | 4. 21. 21. 4 | 9. 34. 57 | 14. 24. 13 | 4. 19 | 11 |
| 15 | Sa. | 4. 22. 18. 47 | 9. 38. 42 | 14. 5. 34 | 4. 8 | 11 |
| 16 | Su. | 4. 23. 16. 30 | 9. 42. 27 | 13. 46. 42 | 3. 57 | 12 |
| 17 | M. | 4. 24. 14. 15 | 9. 46. 12 | 13. 27. 37 | 3. 45 | 13 |
| 18 | Tu. | 4. 25. 12. 2 | 9. 49. 56 | 13. 8. 18 | 3. 32 | 13 |
| 19 | W. | 4. 26. 9. 51 | 9. 53. 40 | 12. 48. 47 | 3. 19 | 14 |
| 20 | Th. | 4. 27. 7. 41 | 9. 57. 22 | 12. 29. 4 | 3. 5 | 14 |
| 21 | F. | 4. 28. 5. 34 | 10. 1. 5 | 12. 9. 9 | 2. 51 | 15 |
| 22 | Sa. | 4. 29. 3. 28 | 10. 4. 47 | 11. 49. 2 | 2. 36 | 15 |
| 23 | Su. | 5. 0. 1. 23 | 10. 8. 28 | 11. 28. 43 | 2. 21 | 16 |
| 24 | M. | 5. 0. 59. 21 | 10. 12. 9 | 11. 8. 14 | 2. 5 | 15 |
| 25 | Tu. | 5. 1. 57. 20 | 10. 15. 50 | 10. 47. 34 | 1. 50 | 17 |
| 26 | W. | 5. 2. 55. 20 | 10. 19. 30 | 10. 26. 44 | 1. 33 | 16 |
| 27 | Th. | 5. 3. 53. 22 | 10. 23. 10 | 10. 5. 43 | 1. 17 | 17 |
| 28 | F. | 5. 4. 51. 25 | 10. 26. 49 | 9. 44. 34 | 1. 0 | 18 |
| 29 | Sa. | 5. 5. 49. 29 | 10. 30. 28 | 9. 23. 14 | 0. 42 | 17 |
| 30 | Su. | 5. 6. 47. 35 | 10. 34. 7 | 9. 1. 47 | 0. 25 | 18 |
| 31 | M. | 5. 7. 45. 43 | 10. 37. 46 | 8. 40. 10 | 0. 7 | |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | ☊ ° ′ |
| 1 | 15. 49, 0 | 1. 6, 5 | 2. 23, 6 | 0. 006253 | 10. 0. 14 |
| 7 | 15. 50, 0 | 1. 6, 0 | 2. 23, 9 | 0. 005831 | 9. 29. 55 |
| 13 | 15. 51, 0 | 1. 5, 5 | 2. 24, 3 | 0. 005367 | 9. 29. 36 |
| 19 | 15. 52, 1 | 1. 5, 1 | 2. 24, 6 | 0. 004874 | 9. 29. 17 |
| 25 | 15. 53, 3 | 1. 4, 6 | 2. 25, 0 | 0. 004311 | 9. 28. 58 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Emersions. | | II. Satellite. Emersions. | | III. Satellite. | | |
|---|---|---|---|---|---|---|
| Days | h ′ ″ | Days | h ′ ″ | Days | h ′ ″ | |
| 2 | 8*17. 52 | 2 | 8. 31. 49 | 7 | 14. 50. 55 | I |
| 4 | 2. 46. 34 | 5 | 21. 50. 41 | 7 | 17. 42. 7 | E |
| 5 | 21. 15. 18 | 9 | 11. 9. 40 | 14 | 18. 51. 7 | I |
| 7 | 15. 43. 59 | 13 | 0. 28. 44 | 14 | 21. 41. 19 | E |
| 9 | 10. 12. 49 | 16 | 13. 47. 52 | IV. Satellite. | | |
| 11 | 4. 41. 39 | | | 14 | 11. 15. 39 | I |
| 12 | 23. 10. 25 | | | 14 | 13. 51. 15 | E |
| 14 | 17. 39. 15 | | | | | |
| 16 | 12. 8. 7 | | | | | |

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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Paſſage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| **MERCURY.** inf. ☌ 25d 22h 10′ | | | | | | |
| 1 | 8. 14. 0 | 3. 19 S | 5. 5. 55 | 1. 51 S | 7. 37 N | 1. 43 |
| 7 | 9. 0. 37 | 4. 57 | 5. 9. 42 | 3. 1 | 5. 8 | 1. 32 |
| 13 | 9. 18. 4 | 6. 12 | 5. 10. 48 | 4. 3 | 3. 47 | 1. 12 |
| 19 | 10. 7. 12 | 6. 56 | 5. 8. 39 | 4. 36 | 4. 2 | 0. 41 |
| 25 | 10. 29. 8 | 6. 48 | 5. 3. 43 | 4. 15 | 6. 12 | 0. 0 |
| **VENUS.** greateſt Elong. 17d | | | | | | |
| 1 | 8. 16. 5 | 0. 5 S | 5. 24. 2 | 0. 5 S | 2. 16 N | 2. 53 |
| 7 | 8. 25. 35 | 0. 39 | 6. 0. 16 | 0. 37 | 0. 40 S | 2. 52 |
| 13 | 9. 5. 5 | 1. 11 | 6. 6. 18 | 1. 12 | 3. 37 | 2. 50 |
| 19 | 9. 14. 34 | 1. 42 | 6. 12. 7 | 1. 50 | 6. 29 | 2. 48 |
| 25 | 9. 24. 3 | 2. 9 | 6. 17. 41 | 2. 31 | 9. 17 | 2. 46 |
| **MARS.** | | | | | | |
| 1 | 4. 28. 17 | 1. 49 N | 4. 20. 57 | 1. 9 N | 15. 36 N | 0. 50 |
| 7 | 5. 0. 55 | 1. 48 | 4. 24. 46 | 1. 8 | 14. 21 | 0. 41 |
| 13 | 5. 3. 32 | 1. 47 | 4. 28. 34 | 1. 7 | 13. 2 | 0. 33 |
| 19 | 5. 6. 9 | 1. 46 | 5. 2. 23 | 1. 6 | 11. 40 | 0. 26 |
| 25 | 5. 8. 47 | 1. 44 | 5. 6. 12 | 1. 5 | 10. 15 | 0. 18 |
| **JUPITER.** | | | | | | |
| 1 | 5. 29. 8 | 1. 18 N | 5. 21. 51 | 1. 8 N | 4. 18 N | 2. 47 |
| 7 | 5. 29. 36 | 1. 18 | 5. 22. 58 | 1. 8 | 3. 51 | 2. 28 |
| 13 | 6. 0. 3 | 1. 18 | 5. 24. 7 | 1. 8 | 3. 22 | 2. 10 |
| 19 | 6. 0. 30 | 1. 18 | 5. 25. 19 | 1. 7 | 2. 53 | 1. 51 |
| 25 | 6. 0. 58 | 1. 18 | 5. 26. 32 | 1. 7 | 2. 24 | 1. 33 |
| **SATURN.** | | | | | | |
| 1 | 2. 24. 57 | 1. 7 S | 2. 29. 6 | 1. 2 S | 22. 26 N | 21. 8 |
| 7 | 2. 25. 11 | 1. 6 | 2. 29. 44 | 1. 2 | 22. 26 | 20. 47 |
| 13 | 2. 25. 24 | 1. 6 | 3. 0. 20 | 1. 2 | 22. 26 | 20. 27 |
| 19 | 2. 25. 38 | 1. 5 | 3. 0. 55 | 1. 2 | 22. 26 | 20. 7 |
| 25 | 2. 25. 51 | 1. 5 | 3. 1. 28 | 1. 2 | 22. 26 | 19. 47 |

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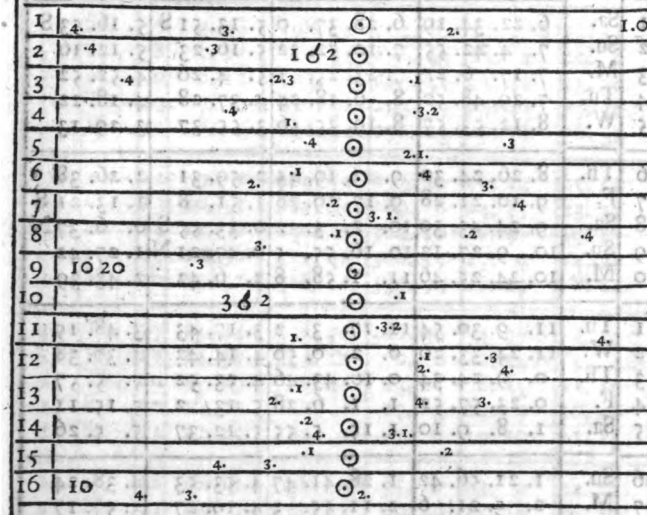
## Configurations of the SATELLITES of JUPITER at 9 o' th' Clock in the Evening.




The Satellites of JUPITER cannot be obſerved from this Time until NOVEMBER, becauſe of his Nearneſs to the SUN.



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# AUGUST 1767.

| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Sa. | 6. 22. 34. 19 | 6. 28. 37. 0 | 5. 13. 51 S | 5. 16. 53 S |
| 2 | Su. | 7. 4. 42. 55 | 7. 10. 52. 32 | 5. 16. 23 | 5. 12. 16 |
| 3 | M. | 7. 17. 6. 22 | 7. 23. 25. 1 | 5. 4. 26 | 4. 52. 52 |
| 4 | Tu. | 7. 29. 48. 50 | 8. 6. 18. 24 | 4. 37. 28 | 4. 18. 22 |
| 5 | W. | 8. 12. 53. 57 | 8. 19. 35. 56 | 3. 55. 37 | 3. 29. 13 |
| 6 | Th. | 8. 26. 24. 30 | 9. 3. 19. 43 | 2. 59. 31 | 2. 26. 38 |
| 7 | F. | 9. 10. 21. 28 | 9. 17. 29. 28 | 1. 51. 8 | 1. 13. 21 S |
| 8 | Sa. | 9. 24. 43. 30 | 10. 2. 3. 2 | 0. 33. 55 S | 0. 6. 37 N |
| 9 | Su. | 10. 9. 27. 12 | 10. 16. 55. 5 | 0. 47. 21 N | 1. 27. 42 |
| 10 | M. | 10. 24. 25. 46 | 11. 1. 58. 8 | 2. 6. 42 | 2. 43. 39 |
| 11 | Tu. | 11. 9. 30. 54 | 11. 17. 3. 2 | 3. 17. 43 | 3. 48. 15 |
| 12 | W. | 11. 24. 33. 20 | 0. 2. 0. 50 | 4. 14. 42 | 4. 36. 38 |
| 13 | Th. | 0. 9. 24. 34 | 0. 16. 43. 46 | 4. 53. 52 | 5. 5. 57 |
| 14 | F. | 0. 23. 57. 52 | 1. 1. 6. 28 | 5. 13. 2 | 5. 15. 11 |
| 15 | Sa. | 1. 8. 9. 10 | 1. 15. 5. 55 | 5. 12. 37 | 5. 5. 26 |
| 16 | Su. | 1. 21. 56. 42 | 1. 28. 41. 47 | 4. 53. 53 | 4. 38. 24 |
| 17 | M. | 2. 5. 21. 6 | 2. 11. 55. 3 | 4. 19. 27 | 3. 57. 17 |
| 18 | Tu. | 2. 18. 23. 56 | 2. 24. 48. 13 | 3. 32. 22 | 3. 5. 5 |
| 19 | W. | 3. 1. 8. 7 | 3. 7. 24. 9 | 2. 35. 50 | 2. 5. 0 |
| 20 | Th. | 3. 13. 36. 34 | 3. 19. 45. 56 | 1. 32. 57 | 1. 0. 9 N |
| 21 | F. | 3. 25. 52. 25 | 4. 1. 56. 34 | 0. 26. 51 N | 0. 6. 24 S |
| 22 | Sa. | 4. 7. 58. 35 | 4. 13. 58. 49 | 0. 39. 26 S | 1. 11. 48 |
| 23 | Su. | 4. 19. 57. 28 | 4. 25. 54. 59 | 1. 43. 13 | 2. 13. 21 |
| 24 | M. | 5. 1. 51. 23 | 5. 7. 47. 5 | 2. 42. 0 | 3. 8. 42 |
| 25 | Tu. | 5. 13. 42. 13 | 5. 19. 37. 3 | 3. 33. 18 | 3. 55. 38 |
| 26 | W. | 5. 25. 31. 47 | 6. 1. 26. 47 | 4. 15. 23 | 4. 32. 23 |
| 27 | Th. | 6. 7. 22. 18 | 6. 13. 18. 33 | 4. 46. 29 | 4. 57. 30 |
| 28 | F. | 6. 19. 15. 50 | 6. 25. 14. 42 | 5. 5. 21 | 5. 9. 52 |
| 29 | Sa. | 7. 1. 15. 21 | 7. 7. 18. 21 | 5. 11. 1 | 5. 8. 44 |
| 30 | Su. | 7. 13. 24. 0 | 7. 19. 32. 48 | 5. 2. 54 | 4. 53. 37 |
| 31 | M. | 7. 25. 45. 18 | 8. 2. 1. 58 | 4. 40. 45 | 4. 24. 26 |

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| Days of the Month. | Days of the Week. | D's Age. | D's Paſſage over Merid. | D's Right Aſcen. at Noon. | D's Right Aſc. at Midn. | D's Declination at Noon. | D's Declination at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h ′ | ° ′ | ° ′ | ° ′ | ° ′ |
| 1 | Sa. | 7 | 4. 38 | 198. 52 | 204. 36 | 13. 38 S | 15. 55 S |
| 2 | Su. | 8 | 5. 23 | 210. 34 | 216. 43 | 18. 4 | 20. 3 |
| 3 | M. | 9 | 6. 12 | 223. 5 | 229. 41 | 21. 49 | 23. 22 |
| 4 | Tu. | 10 | 7. 6 | 236. 32 | 243. 37 | 24. 40 | 25. 38 |
| 5 | W. | 11 | 8. 2 | 250. 54 | 258. 23 | 26. 16 | 26. 32 |
| 6 | Th. | 12 | 9. 1 | 265. 59 | 273. 42 | 26. 24 | 25. 52 |
| 7 | F. | 13 | 10. 1 | 281. 25 | 289. 8 | 24. 55 | 23. 32 |
| 8 | Sa. | 14 | 11. 0 | 296. 47 | 304. 18 | 21. 46 | 19. 37 |
| 9 | Su. | 15 | 11. 56 | 311. 41 | 318. 55 | 17. 9 | 14. 24 |
| 10 | M. | 16 | 12. 52 | 326. 1 | 332. 59 | 11. 25 | 8. 14 |
| 11 | Tu. | 17 | 13. 44 | 339. 50 | 346. 36 | 4. 56 S | 1. 37 S |
| 12 | W. | 18 | 14. 36 | 353. 19 | 0. 0 | 1. 44 N | 5. 2 N |
| 13 | Th. | 19 | 15. 29 | 6. 42 | 13. 25 | 8. 15 | 11. 17 |
| 14 | F. | 20 | 16. 21 | 20. 12 | 27. 3 | 14. 9 | 16. 48 |
| 15 | Sa. | 21 | 17. 15 | 34. 0 | 41. 2 | 19. 10 | 21. 15 |
| 16 | Su. | 22 | 18. 11 | 48. 9 | 55. 20 | 23. 0 | 24. 25 |
| 17 | M. | 23 | 19. 7 | 62. 35 | 69. 49 | 25. 28 | 26. 10 |
| 18 | Tu. | 24 | 20. 3 | 77. 2 | 84. 12 | 26. 29 | 26. 27 |
| 19 | W. | 25 | 20. 56 | 91. 16 | 98. 12 | 26. 4 | 25. 21 |
| 20 | Th. | 26 | 21. 46 | 104. 58 | 111. 33 | 24. 19 | 23. 0 |
| 21 | F. | 27 | 22. 33 | 117. 57 | 124. 11 | 21. 26 | 19. 39 |
| 22 | Sa. | 28 | 23. 17 | 130. 14 | 136. 6 | 17. 39 | 15. 30 |
| 23 | Su. | 29 | 23. 59 | 141. 49 | 147. 24 | 13. 13 | 10. 48 |
| 24 | M. | 30 | ♂ | 152. 53 | 158. 17 | 8. 18 | 5. 44 |
| 25 | Tu. | 1 | 0. 40 | 163. 37 | 168. 55 | 3. 8 N | 0. 30 N |
| 26 | W. | 2 | 1. 20 | 174. 12 | 179. 31 | 2. 8 S | 4. 44 S |
| 27 | Th. | 3 | 2. 0 | 184. 52 | 190. 17 | 7. 19 | 9. 49 |
| 28 | F. | 4 | 2. 41 | 195. 48 | 201. 26 | 12. 15 | 14. 35 |
| 29 | Sa. | 5 | 3. 25 | 207. 13 | 213. 11 | 16. 47 | 18. 49 |
| 30 | Su. | 6 | 4. 15 | 219. 19 | 225. 39 | 20. 41 | 22. 21 |
| 31 | M. | 7 | 5. 2 | 232. 12 | 238. 58 | 23. 46 | 24. 55 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logiftic Logar. at Noon. | Logiftic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Sa. | 14. 54 | 14. 58 | 54. 43 | 54. 57 | 0400 | 0382 |
| 2 | Su. | 15. 3 | 15. 8 | 55. 14 | 55. 31 | 0359 | 0337 |
| 3 | M. | 15. 13 | 15. 20 | 55. 52 | 56. 15 | 0310 | 0280 |
| 4 | Tu. | 15. 26 | 15. 34 | 56. 41 | 57. 7 | 0247 | 0214 |
| 5 | W. | 15. 41 | 15. 49 | 57. 34 | 58. 3 | 0180 | 0143 |
| 6 | Th. | 15. 57 | 16. 4 | 58. 31 | 58. 59 | 0109 | 0074 |
| 7 | F. | 16. 12 | 16. 19 | 59. 26 | 59. 52 | 0041 | 0010 |
| 8 | Sa. | 16. 25 | 16. 30 | 60. 15 | 60. 35 | 9982 | 9958 |
| 9 | Su. | 16. 35 | 16. 38 | 60. 51 | 61. 3 | 9939 | 9925 |
| 10 | M. | 16. 40 | 16. 41 | 61. 10 | 61. 13 | 9916 | 9913 |
| 11 | Tu. | 16. 41 | 16. 39 | 61. 12 | 61. 6 | 9914 | 9921 |
| 12 | W. | 16. 36 | 16. 32 | 60. 56 | 60. 42 | 9933 | 9950 |
| 13 | Th. | 16. 28 | 16. 22 | 60. 25 | 60. 5 | 9970 | 9994 |
| 14 | F. | 16. 16 | 16. 10 | 59. 43 | 59. 20 | 0021 | 0049 |
| 15 | Sa. | 16. 3 | 15. 57 | 58. 57 | 58. 32 | 0077 | 0107 |
| 16 | Su. | 15. 51 | 15. 44 | 58. 9 | 57. 44 | 0136 | 0167 |
| 17 | M. | 15. 37 | 15. 32 | 57. 21 | 56. 59 | 0196 | 0224 |
| 18 | Tu. | 15. 26 | 15. 20 | 56. 38 | 56. 18 | 0251 | 0276 |
| 19 | W. | 15. 16 | 15. 11 | 56. 0 | 55. 43 | 0300 | 0322 |
| 20 | Th. | 15. 7 | 15. 3 | 55. 27 | 55. 13 | 0342 | 0361 |
| 21 | F. | 15. 0 | 14. 56 | 55. 1 | 54. 49 | 0377 | 0392 |
| 22 | Sa. | 14. 53 | 14. 51 | 54. 39 | 54. 30 | 0406 | 0418 |
| 23 | Su. | 14. 49 | 14. 47 | 54. 22 | 54. 16 | 0428 | 0436 |
| 24 | M. | 14. 46 | 14. 45 | 54. 11 | 54. 7 | 0443 | 0448 |
| 25 | Tu. | 14. 44 | 14. 44 | 54. 4 | 54. 3 | 0452 | 0454 |
| 26 | W. | 14. 44 | 14. 44 | 54. 3 | 54. 5 | 0454 | 0451 |
| 27 | Th. | 14. 45 | 14. 46 | 54. 8 | 54. 13 | 0447 | 0440 |
| 28 | F. | 14. 48 | 14. 51 | 54. 20 | 54. 29 | 0431 | 0419 |
| 29 | Sa. | 14. 54 | 14. 57 | 54. 41 | 54. 53 | 0403 | 0387 |
| 30 | Su. | 15. 1 | 15. 6 | 55. 8 | 55. 26 | 0367 | 0344 |
| 31 | M. | 15. 11 | 15. 17 | 55. 45 | 56. 7 | 0319 | 0291 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Antares. | 43. 47. 32 | 42. 17. 29 | 40. 47. 17 | 39. 16. 55 |
| 2 | α Aquilæ | 87. 11. 41 | 85. 51. 51 | 84. 31. 52 | 83. 11. 44 |
| 3 | | 76. 28. 53 | 75. 7. 56 | 73. 46. 52 | 72. 25. 44 |
| 4 | β Capri- | 61. 37. 36 | 60. 1. 22 | 58. 24. 46 | 56. 47. 48 |
| 5 | corni. | 48. 37. 21 | 46. 58. 7 | 45. 18. 27 | 43. 38. 23 |
| 6 | | 85. 12. 28 | 83. 32. 52 | 81. 52. 50 | 80. 12. 26 |
| 7 | α Pegaſi. | 71. 44. 54 | 70. 2. 24 | 68. 19. 37 | 66. 36. 35 |
| 8 | | 57. 57. 54 | 56. 13. 38 | 54. 29. 19 | 52. 44. 59 |
| 9 | | 44. 4. 35 | 42. 21. 17 | 40. 38. 25 | 38. 56. 2 |
| 10 | α Arietis. | 69. 55. 50 | 68. 2. 58 | 66. 10. 4 | 64. 17. 9 |
| 11 | | 54. 52. 53 | 53. 0. 14 | 51. 7. 43 | 49. 15. 21 |
| 12 | | 72. 33. 6 | 70. 42. 48 | 68. 52. 50 | 67. 3. 10 |
| 13 | Aldeba- | 57. 59. 35 | 56. 11. 56 | 54. 24. 42 | 52. 37. 52 |
| 14 | ran. | 43. 50. 39 | 42. 6. 45 | 40. 23. 28 | 38. 40. 48 |
| 15 | | 30. 18. 7 | 28. 40. 6 | 27. 3. 8 | 25. 27. 21 |
| 14 | | 117. 15. 50 | 115. 35. 49 | 113. 56. 11 | 112. 16. 54 |
| 15 | | 104. 6. 2 | 102. 28. 58 | 100. 52. 15 | 99. 15. 54 |
| 16 | | 91. 19. 30 | 89. 45. 15 | 88. 11. 20 | 86. 37. 47 |
| 17 | The Sun. | 78. 55. 4 | 77. 23. 29 | 75. 52. 13 | 74. 21. 16 |
| 18 | | 66. 50. 54 | 65. 21. 38 | 63. 52. 38 | 62. 23. 56 |
| 19 | | 55. 4. 12 | 53. 36. 57 | 52. 9. 56 | 50. 43. 8 |
| 20 | | 43. 32. 26 | 42. 6. 54 | 40. 41. 33 | 39. 16. 22 |
| 26 | Spica ♍ | 25. 7. 51 | 23. 40. 1 | 22. 12. 17 | 20. 44. 39 |
| 27 | | 58. 56. 22 | 57. 27. 42 | 55. 58. 57 | 54. 30. 8 |
| 28 | Antares. | 47. 5. 15 | 45. 36. 2 | 44. 6. 44 | 42. 37. 19 |
| 29 | | 35. 8. 39 | 33. 38. 31 | 32. 8. 14 | 30. 37. 46 |
| 30 | α Aquilæ | 79. 37. 9 | 78. 17. 49 | 76. 58. 26 | 75. 39. 0 |
| 31 | | 69. 1. 23 | 67. 41. 53 | 66. 22. 27 | 65. 3. 7 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Antares. | 37. 46. 22 | 36. 15. 36 | 34. 44. 37 | 33. 13. 25 |
| 2 | α Aquilæ. | 81. 51. 27 | 80. 31. 0 | 79. 10. 25 | 77. 49. 43 |
| 3 | | 71. 4. 33 | 69. 43. 21 | 68. 22. 6 | 67. 0. 48 |
| 4 | β Capri- | 55. 10. 28 | 53. 32. 46 | 51. 54. 41 | 50. 16. 13 |
| 5 | corni. | 41. 57. 55 | 40. 17. 4 | 38. 35. 52 | 36. 54. 17 |
| 6 | | 78. 31. 37 | 76. 50. 27 | 75. 8. 56 | 73. 27. 5 |
| 7 | α Pegaſi. | 64. 53. 16 | 63. 9. 43 | 61. 25. 58 | 59. 42. 1 |
| 8 | | 51. 0. 38 | 49. 16. 21 | 47. 32. 12 | 45. 48. 15 |
| 9 | | 77. 26. 20 | 75. 33. 54 | 73. 41. 19 | 71. 48. 37 |
| 10 | α Arietis. | 62. 24. 12 | 60. 31. 17 | 58. 38. 26 | 56. 45. 38 |
| 11 | | 47. 23. 7 | 45. 31. 5 | 43. 39. 17 | 41. 47. 43 |
| 12 | | 65. 13. 49 | 63. 24. 45 | 61. 36. 1 | 59. 47. 37 |
| 13 | Aldeba- | 50. 51. 28 | 49. 5. 30 | 47. 20. 3 | 45. 35. 6 |
| 14 | ran. | 36. 58. 46 | 35. 17. 24 | 33. 36. 48 | 31. 57. 2 |
| 15 | | 23. 52. 58 | 22. 20. 12 | 20. 49. 17 | 19. 20. 28 |
| 14 | | 110. 38. 0 | 108. 59. 28 | 107. 21. 17 | 105. 43. 29 |
| 15 | | 97. 39. 54 | 96. 4. 17 | 94. 29. 0 | 92. 54. 5 |
| 16 | The Sun. | 85. 4. 34 | 83. 31. 41 | 81. 59. 8 | 80. 26. 56 |
| 17 | | 72. 50. 37 | 71. 20. 14 | 69. 50. 9 | 68. 20. 23 |
| 18 | | 60. 55. 29 | 59. 27. 16 | 57. 59. 19 | 56. 31. 38 |
| 19 | | 49. 16. 33 | 47. 50. 12 | 46. 24. 4 | 44. 58. 9 |
| 26 | Spica ♍ | 19. 17. 9 | 17. 49. 47 | 16. 22. 38 | 14. 54. 44 |
| 27 | Antares. | 53. 1. 15 | 51. 32. 22 | 50. 3. 24 | 48. 34. 23 |
| 28 | | 41. 7. 49 | 39. 38. 13 | 38. 8. 29 | 36. 38. 38 |
| 29 | | 84. 53. 45 | 83. 34. 42 | 82. 15. 35 | 80. 56. 24 |
| 30 | α Aquilæ. | 74. 19. 31 | 72. 59. 59 | 71. 40. 27 | 70. 20. 55 |
| 31 | | 63. 43. 51 | 62. 24. 43 | 61. 5. 44 | 59. 46. 57 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 73. 45. 37 | 75. 8. 28 | 76. 31. 31 | 77. 54. 44 |
| 2 | The Sun. | 84. 53. 52 | 86. 18. 21 | 87. 43. 5 | 89. 8. 4 |
| 3 | | 96. 17. 4 | 97. 43. 45 | 99. 10. 46 | 100. 38. 5 |
| 4 | | 107. 59. 51 | 109. 29. 18 | 110. 59. 9 | 112. 29. 24 |
| 3 | | 26. 37. 23 | 28. 10. 32 | 29. 44. 4 | 31. 18. 0 |
| 4 | Spica ♍ | 39. 13. 26 | 40. 49. 42 | 42. 26. 23 | 44. 3. 28 |
| 5 | | 52. 15. 6 | 53. 54. 43 | 55. 34. 46 | 57. 15. 16 |
| 6 | | 19. 53. 59 | 21. 37. 18 | 23. 21. 3 | 25. 5. 16 |
| 7 | Antares. | 33. 52. 51 | 35. 39. 37 | 37. 26. 47 | 39. 14. 21 |
| 8 | | 48. 18. 6 | 50. 7. 58 | 51. 58. 9 | 53. 48. 40 |
| 9 | | 63. 5. 31 | 64. 57. 38 | 66. 49. 56 | 68. 42. 26 |
| 10 | β Capri- | 23. 42. 23 | 25. 33. 46 | 27. 25. 18 | 29. 16. 59 |
| 11 | corni. | 38. 37. 44 | 40. 30. 4 | 42. 22. 21 | 44. 14. 36 |
| 12 | α Aquilæ. | 58. 32. 31 | 60. 4. 32 | 61. 37. 3 | 63. 9. 57 |
| 13 | | 70. 58. 21 | 72. 32. 28 | 74. 6. 34 | 75. 40. 40 |
| 14 | | 35. 44. 53 | 27. 20. 56 | 38. 57. 27 | 40. 34. 22 |
| 15 | α Pegaſi. | 48. 42. 7 | 50. 19. 54 | 51. 57. 40 | 53. 35. 21 |
| 16 | | 61. 41. 56 | 63. 18. 48 | 64. 55. 29 | 66. 31. 57 |
| 17 | α Arietis. | 31. 11. 5 | 32. 48. 45 | 34. 26. 12 | 36. 3. 25 |
| 18 | | 44. 6. 9 | 45. 42. 3 | 47. 17. 42 | 48. 53. 8 |
| 19 | Aldeba- | 25. 51. 19 | 27. 18. 53 | 28. 46. 55 | 30. 15. 20 |
| 20 | ran. | 37. 40. 43 | 39. 10. 7 | 40. 39. 33 | 42. 9. 2 |
| 21 | | 49. 36. 34 | 51. 5. 57 | 52. 35. 18 | 54. 4. 35 |
| 28 | | 44. 38. 13 | 46. 0. 2 | 47. 21. 56 | 48. 43. 56 |
| 29 | The Sun. | 55. 35. 34 | 56. 58. 19 | 58. 21. 13 | 59. 44. 17 |
| 30 | | 66. 42. 10 | 68. 6. 20 | 69. 30. 43 | 70. 55. 20 |
| 31 | | 78. 2. 1 | 79. 28. 9 | 80. 54. 35 | 82. 21. 17 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 79. 18. 9 | 80. 41. 44 | 82. 5. 32 | 83. 29. 35 |
| 2 | The Sun. | 90. 33. 18 | 91. 58. 48 | 93. 24. 36 | 94 50. 41 |
| 3 | | 102. 5. 45 | 103. 33. 45 | 105. 2. 6 | 106. 30. 48 |
| 4 | | 114. 0. 2 | 115. 31. 1 | 117. 2. 25 | 118. 34. 13 |
| 2 | | 20. 28. 32 | 22. 0. 10 | 23. 32. 11 | 25. 4. 35 |
| 3 | Spica ♍ | 32. 52. 20 | 34. 27. 1 | 36. 2. 6 | 37. 37. 34 |
| 4 | | 45. 40. 59 | 47. 18. 53 | 48. 57. 13 | 50. 35. 57 |
| 5 | | 58. 56. 12 | 60. 37. 35 | 62. 19. 25 | 64. 1. 41 |
| 6 | | 26. 49. 55 | 28. 35. 1 | 30. 20. 32 | 32. 6. 29 |
| 7 | Antares. | 41. 2. 20 | 42. 50. 43 | 44. 39. 29 | 46. 28. 36 |
| 8 | | 55. 39. 30 | 57. 30. 37 | 59. 21. 59 | 61. 13. 37 |
| 9 | | 70. 35. 7 | 72. 27. 55 | 74. 20. 52 | 76. 13. 59 |
| 10 | β Capricorni. | 31. 8. 50 | 33. 0. 49 | 34. 52. 57 | 36. 45. 15 |
| 11 | | 52. 31. 12 | 54. 0. 17 | 55. 30. 17 | 57. 1. 4 |
| 12 | α Aquilæ. | 64. 43. 12 | 66. 16. 42 | 67. 50. 26 | 69. 24. 19 |
| 13 | | 77. 14. 46 | 78. 48. 45 | 80. 22. 34 | 81. 56. 15 |
| 14 | | 42. 11. 36 | 43. 49. 3 | 45. 26. 40 | 47. 4. 22 |
| 15 | α Pegaſi. | 55. 12. 55 | 56. 50. 23 | 58. 27. 43 | 60. 4. 54 |
| 16 | | 68. 8. 12 | 69. 44. 13 | 71. 20. 0 | 72. 55. 32 |
| 17 | α Arietis. | 37. 40. 25 | 39. 17. 11 | 40. 53. 44 | 42. 30. 3 |
| 18 | | 50. 28. 21 | 52. 3. 18 | 53. 38. 1 | 55. 12. 34 |
| 19 | Aldébaran. | 31. 44. 4 | 33. 13. 1 | 34. 42. 8 | 36. 11. 23 |
| 20 | | 43. 38. 33 | 45. 8. 4 | 46. 37. 36 | 48. 7. 6 |
| 21 | | 55. 33. 50 | 57. 3. 1 | 58. 32. 8 | 60. 1. 11 |
| 28 | | 50. 6. 1 | 51. 28. 13 | 52. 50. 32 | 54. 12. 59 |
| 29 | The Sun. | 61. 7. 30 | 62. 30. 53 | 63. 54. 27 | 65. 18. 13 |
| 30 | | 72. 20. 10 | 73. 45. 15 | 75. 10. 34 | 76. 36. 10 |
| 31 | | 83. 48. 18 | 85. 15. 37 | 86. 43. 15 | 88. 11. 12 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | Tu. | Giles. |
| 2 | W. | Lond. burnt, 1666, O.S. |
| 3 | Th. | |
| 4 | F. | |
| 5 | Sa. | |
| 6 | Su. | 12th *Sunday after Trinity.* |
| 7 | M. | Enurchus. |
| 8 | Tu. | Nativity of B.V.Mary. |
| 9 | W. | |
| 10 | Th. | |
| 11 | F. | |
| 12 | Sa. | |
| 13 | Su. | 13th *Sunday after Trinity.* |
| 14 | M. | Holy Croſs. |
| 15 | Tu. | |
| 16 | W. | |
| 17 | Th. | Lambert. |
| 18 | F. | |
| 19 | Sa. | |
| 20 | Su. | 14th *Sunday after Trinity.* |
| 21 | M. | St. Matthew. |
| 22 | Tu. | K. George III. crowned [1761. |
| 23 | W. | |
| 24 | Th. | |
| 25 | F. | |
| 26 | Sa. | St. Cyprian. |
| 27 | Su. | 15th *Sunday after Trinity.* |
| 28 | M. | |
| 29 | Tu. | St. Michael. |
| 30 | W. | St. Jerome. |

## Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Firſt Quarter — | 1. | 0. | 4 |
| Full Moon — | 7. | 20. | 4 |
| Laſt Quarter — | 14. | 12. | 4 |
| New Moon — | 22. | 14. | 4 |
| Firſt Quarter — | 30. | 12. | 5 |

## Other Phenomena.

D.

1. ♄ μ ☐ diff. Lat. 11′.
2. ☾ λ ♐ 21h. 2′.
6. ☾ θ ♒ 19h. 52′.
10. ☾ ν ♓ 8h. 28′.
12. ☽ in the Pleiades; ν imm. 15h. 25′; em. 16h. 38′; diſt. of Center at middle 5′.
13. ☿ ☍ ☊ diff. Lat. 45′.
14. ☾ 3 poſt ζ ♉ 13h. 21′.
15. ☾ ☌ ♊ 16h. 37′.
18. ☾ ♂ ☍ 0h. 56′.
21. ☾ υ ☊ 22h. 25′.
22. ☉ enters ♎ at 19h. 41′.
25. ☾ ♀ at 22h 10′; ♀ 82′ more South.
27. ☾ π ♏ 13h. 50′
☾ σ ♏ 23h. 12′.
28. ☾ α ♏ 3h. 55′.
30. ☾ λ ♐ 4h. 38′.



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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declination North. | Equat. of Time Sub. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | Tu. | 5. 8. 43. 51 | 10. 41. 24 | 8. 18. 25 | 0. 12 | 18 |
| 2 | W. | 5. 9. 42. 1 | 10. 45. 2 | 7. 56. 33 | 0. 30 | 19 |
| 3 | Th. | 5. 10. 40. 13 | 10. 48. 40 | 7. 34. 32 | 0. 49 | 20 |
| 4 | F. | 5. 11. 38. 26 | 10. 52. 16 | 7. 12. 25 | 1. 9 | 20 |
| 5 | Sa. | 5. 12. 36. 40 | 10. 55. 54 | 6. 50. 10 | 1. 29 | 20 |
| 6 | Su. | 5. 13. 34. 56 | 10. 59. 30 | 6. 27. 49 | 1. 49 | 20 |
| 7 | M. | 5. 14. 33. 13 | 11. 3. 7 | 6. 5. 21 | 2. 9 | 20 |
| 8 | Tu. | 5. 15. 31. 32 | 11. 6. 42 | 5. 42. 48 | 2. 29 | 20 |
| 9 | W. | 5. 16. 29. 54 | 11. 10. 19 | 5. 20. 8 | 2. 49 | 21 |
| 10 | Th. | 5. 17. 28. 17 | 11. 13. 55 | 4. 57. 23 | 3. 10 | 20 |
| 11 | F. | 5. 18. 26. 42 | 11. 17. 31 | 4. 34. 33 | 3. 30 | 21 |
| 12 | Sa. | 5. 19. 25. 9 | 11. 21. 6 | 4. 11. 39 | 3. 51 | 21 |
| 13 | Su. | 5. 20. 23. 38 | 11. 24. 42 | 3. 48. 39 | 4. 12 | 21 |
| 14 | M. | 5. 21. 22. 10 | 11. 28. 18 | 3. 25. 35 | 4. 33 | 21 |
| 15 | Tu. | 5. 22. 20. 44 | 11. 31. 54 | 3. 2. 28 | 4. 54 | 21 |
| 16 | W. | 5. 23. 19. 20 | 11. 35. 28 | 2. 39. 17 | 5. 15 | 21 |
| 17 | Th. | 5. 24. 17. 58 | 11. 39. 4 | 2. 16. 2 | 5. 36 | 21 |
| 18 | F. | 5. 25. 16. 39 | 11. 42. 40 | 1. 52. 44 | 5. 57 | 21 |
| 19 | Sa. | 5. 26. 15. 22 | 11. 46. 16 | 1. 29. 25 | 6. 18 | 21 |
| 20 | Su. | 5. 27. 14. 7 | 11. 49. 51 | 1. 6. 3 | 6. 39 | 21 |
| 21 | M. | 5. 28. 12. 55 | 11. 53. 27 | 0. 42. 39 | 7. 0 | 20 |
| 22 | Tu. | 5. 29. 11. 44 | 11. 57. 2 | 0. 19. 13 South. | 7. 20 | 21 |
| 23 | W. | 6. 0. 10. 36 | 12. 0. 39 | 0. 4. 13 | 7. 41 | 20 |
| 24 | Th. | 6. 1. 9. 29 | 12. 4. 15 | 0. 27. 40 | 8. 1 | 21 |
| 25 | F. | 6. 2. 8. 25 | 12. 7. 51 | 0. 51. 8 | 8. 22 | 20 |
| 26 | Sa. | 6. 3. 7. 22 | 12. 11. 28 | 1. 14. 36 | 8. 42 | 19 |
| 27 | Su. | 6. 4. 6. 22 | 12. 15. 5 | 1. 38. 3 | 9. 1 | 20 |
| 28 | M. | 6. 5. 5. 23 | 12. 18. 41 | 2. 1. 30 | 9. 21 | 20 |
| 29 | Tu. | 6. 6. 4. 25 | 12. 22. 18 | 2. 24. 55 | 9. 41 | 19 |
| 30 | W. | 6. 7. 3. 30 | 12. 25. 55 | 2. 48. 19 | 10. 0 | 20 |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | ♑ ● ′ |
| 1 | 15. 54, 8 | 1. 4, 3 | 2. 25, 3 | 0. 003570 | 9. 28. 36 |
| 7 | 15. 56, 4 | 1. 4, 1 | 2. 25, 7 | 0. 002893 | 9. 28. 17 |
| 13 | 15. 57, 9 | 1. 4, 0 | 2. 26, 2 | 0. 002204 | 9. 27. 58 |
| 19 | 15. 59, 4 | 1. 4, 0 | 2. 26, 7 | 0. 001503 | 9. 27. 39 |
| 25 | 16. 1, 1 | 1. 4, 1 | 2. 27, 2 | 0. 000767 | 9. 27. 20 |

The Eclipses of JUPITER's Satellites will not be visible this Month, JUPITER being too near the SUN.



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| Days | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | | | MERCURY. greatest Elong. 11d | | | |
| 1 | 11. 29. 52 | 5. 2 S | 4. 28. 16 | 2. 32 S | 9. 43 N | 23. 14 |
| 7 | 1. 1. 50 | 1. 41 | 4. 27. 54 | 0. 39 | 11. 36 | 22. 56 |
| 13 | 2. 8. 23 | 2. 41 N | 5. 2. 41 | 0. 50 N | 11. 19 | 22. 55 |
| 19 | 3. 15. 51 | 6. 4 | 5. 11. 19 | 1. 40 | 8. 52 | 23. 7 |
| 25 | 4. 19. 39 | 6. 58 | 5. 21. 46 | 1. 52 | 4. 58 | 23. 25 |
| | | | VENUS. | | | |
| 1 | 10. 5. 7 | 2. 37 S | 6. 23. 46 | 3. 21 S | 12. 21 S | 2. 41 |
| 7 | 10. 14. 36 | 2. 56 | 6. 28. 32 | 4. 5 | 14. 47 | 2. 37 |
| 13 | 10. 24. 5 | 3. 11 | 7. 2. 45 | 4. 49 | 16. 58 | 2. 31 |
| 19 | 11. 3. 36 | 3. 20 | 7. 6. 19 | 5. 33 | 18. 52 | 2. 22 |
| 25 | 11. 13. 6 | 3. 23 | 7. 9. 3 | 6. 13 | 20. 25 | 2. 10 |
| | | | MARS. ♂ 6d 20h | | | |
| 1 | 5. 11. 51 | 1. 42 N | 5. 10. 40 | 1. 3 N | 8. 33 N | 0. 9 |
| 7 | 5. 14. 28 | 1. 39 | 5. 14. 31 | 1. 2 | 7. 3 | 0. 2 |
| 13 | 5. 17. 7 | 1. 37 | 5. 18. 21 | 1. 1 | 5. 32 | 23. 54 |
| 19 | 5. 19. 46 | 1. 34 | 5. 22. 12 | 0. 59 | 4. 0 | 23. 47 |
| 25 | 5. 22. 24 | 1. 32 | 5. 26. 5 | 0. 57 | 2. 26 | 23. 39 |
| | | | JUPITER. ♂ 26d 6h 45′ | | | |
| 1 | 6. 1. 29 | 1. 18 N | 5. 27. 59 | 1. 7 N | 1. 49 N | 1. 13 |
| 7 | 6. 1. 56 | 1. 19 | 5. 29. 15 | 1. 7 | 1. 19 | 0. 56 |
| 13 | 6. 2. 24 | 1. 19 | 6. 0. 32 | 1. 7 | 0. 49 | 0. 39 |
| 19 | 6. 2. 51 | 1. 19 | 6. 1. 50 | 1. 7 | 0. 17 | 0. 22 |
| 25 | 6. 3. 18 | 1. 19 | 6. 3. 7 | 1. 6 | 0. 13 S | 0. 5 |
| | | | SATURN. □ 26d 8h | | | |
| 1 | 2. 26. 7 | 1. 4 S | 3. 2. 2 | 1. 2 S | 22. 25 N | 19. 24 |
| 7 | 2. 26. 21 | 1. 4 | 3. 2. 28 | 1. 2 | 22. 25 | 19. 5 |
| 13 | 2. 26. 34 | 1. 3 | 3. 2. 50 | 1. 2 | 22. 24 | 18. 45 |
| 19 | 2. 26. 48 | 1. 3 | 3. 3. 10 | 1. 2 | 22. 24 | 18. 24 |
| 25 | 2. 27. 1 | 1. 2 | 3. 3. 25 | 1. 2 | 22. 23 | 18. 4 |

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JUPITER's Satellites will not be visible this Month, being too near the SUN.

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| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ● ′ ″ | S ○ ′ ″ | ○ ′ ″ | ○ ′ ″ |
| 1 | Tu. | 8. 8. 23. 16 | 8. 14. 49. 49 | 4. 4. 37 S | 3. 41. 29 S |
| 2 | W. | 8. 21. 21. 59 | 8. 28. 0. 9 | 3. 15. 7 | 2. 45. 49 |
| 3 | Th. | 9. 4. 44. 33 | 9. 11. 35. 45 | 2. 13. 41 | 1. 39. 9 |
| 4 | F. | 9. 18. 34. 0 | 9. 25. 39. 4 | 1. 2. 34 S | 0. 24. 28 S |
| 5 | Sa. | 10. 2. 50. 50 | 10. 10. 9. 13 | 0. 14. 33 N | 0. 53. 58 N |
| 6 | Su. | 10. 17. 33. 28 | 10. 25. 3. 0 | 1. 32. 52 | 2. 10. 32 |
| 7 | M. | 11. 2. 36. 47 | 11. 10. 13. 40 | 2. 46. 20 | 3. 19. 27 |
| 8 | Tu. | 11. 17. 52. 22 | 11. 25. 31. 40 | 3. 49. 0 | 4. 14. 26 |
| 9 | W. | 0. 3. 9. 54 | 0. 10. 45. 49 | 4. 35. 16 | 4. 51. 1 |
| 10 | Th. | 0. 18. 18. 2 | 0. 25. 45. 36 | 5. 1. 37 | 5. 6. 56 |
| 11 | F. | 1. 3. 7. 23 | 1. 10. 22. 52 | 5. 7. 7 | 5. 2. 18 |
| 12 | Sa. | 1. 17. 31. 21 | 1. 24. 32. 47 | 4. 52. 47 | 4. 39. 3 |
| 13 | Su. | 2. 1. 26. 49 | 2. 8. 13. 44 | 4. 21. 28 | 4. 0. 26 |
| 14 | M. | 2. 14. 53. 49 | 2. 21. 27. 21 | 3. 36. 27 | 3. 10. 1 |
| 15 | Tu. | 2. 27. 54. 40 | 3. 4. 16. 26 | 2. 41. 30 | 2. 11. 27 |
| 16 | W. | 3. 10. 33. 9 | 3. 16. 45. 19 | 1. 40. 9 | 1. 8. 7 |
| 17 | Th. | 3. 22. 53. 31 | 3. 28. 58. 20 | 0. 35. 35 N | 0. 2. 56 N |
| 18 | F. | 4. 5. 0. 24 | 4. 11. 0. 10 | 0. 29. 25 S | 1. 1. 13 S |
| 19 | Sa. | 4. 16. 58. 3 | 4. 22. 54. 39 | 1. 32. 11 | 2. 1. 53 |
| 20 | Su. | 4. 28. 50. 13 | 5. 4. 45. 13 | 2. 30. 15 | 2. 56. 48 |
| 21 | M. | 5. 10. 39. 56 | 5. 16. 34. 38 | 3. 21. 25 | 3. 43. 51 |
| 22 | Tu. | 5. 22. 29. 29 | 5. 28. 24. 55 | 4. 3. 52 | 4. 21. 12 |
| 23 | W. | 6. 4. 20. 54 | 6. 10. 17. 46 | 4. 35. 45 | 4. 47. 16 |
| 24 | Th. | 6. 16. 15. 38 | 6. 22. 14. 38 | 4. 55. 42 | 5. 0. 53 |
| 25 | F. | 6. 28. 14. 59 | 7. 4. 16. 50 | 5. 2. 46 | 5. 1. 16 |
| 26 | Sa. | 7. 10. 20. 34 | 7. 16. 26. 24 | 4. 56. 22 | 4. 48. 4 |
| 27 | Su. | 7. 22. 34. 29 | 7. 28. 45. 19 | 4. 36. 23 | 4. 21. 23 |
| 28 | M. | 8. 4. 59. 4 | 8. 11. 16. 13 | 4. 3. 7 | 3. 41. 45 |
| 29 | Tu. | 8. 17. 37. 7 | 8. 24. 2. 15 | 3. 17. 28 | 2. 50. 23 |
| 30 | W. | 9. 0. 32. 8 | 9. 7. 6. 57 | 2. 20. 49 | 1. 48. 52 |

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| Days of the Month. | Days of the Week. | D's Age. | D's Passage over Merid. | D's Right Ascen. at Noon. | D's Right Asc. at Midn. | D's Declination at Noon. | D's Declination at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h ′ | ° ′ | ° ′ | ° ′ | ° ′ |
| 1 | Tu. | 8 | 5. 56 | 245. 55 | 253. 4 | 25. 46 S | 26. 16 S |
| 2 | W. | 9 | 6. 53 | 260. 22 | 267. 46 | 26. 26 | 26. 13 |
| 3 | Th. | 10 | 7. 51 | 275. 14 | 282. 46 | 25. 36 | 24. 37 |
| 4 | F. | 11 | 8. 49 | 290. 16 | 297. 43 | 23. 13 | 21. 27 |
| 5 | Sa. | 12 | 9. 47 | 305. 5 | 312. 21 | 19. 19 | 16. 51 |
| 6 | Su. | 13 | 10. 42 | 319. 31 | 326. 36 | 14. 7 | 11. 8 |
| 7 | M. | 14 | 11. 36 | 333. 35 | 340. 29 | 7. 58 | 4. 40 S |
| 8 | Tu. | 15 | 12. 29 | 347. 22 | 354. 13 | 1. 17 S | 2. 7 N |
| 9 | W. | 16 | 13. 23 | 1. 5 | 7. 58 | 5. 28 N | 8. 43 |
| 10 | Th. | 17 | 14. 17 | 14. 55 | 21. 57 | 11. 50 | 14. 44 |
| 11 | F. | 18 | 15. 13 | 29. 4 | 36. 17 | 17. 22 | 19. 44 |
| 12 | Sa. | 19 | 16. 10 | 43. 35 | 50. 56 | 21. 46 | 23. 26 |
| 13 | Su. | 20 | 17. 8 | 58. 20 | 65. 46 | 24. 44 | 25. 40 |
| 14 | M. | 21 | 18. 5 | 73. 10 | 80. 28 | 26. 12 | 26. 21 |
| 15 | Tu. | 22 | 19. 0 | 87. 40 | 94. 44 | 26. 8 | 25. 36 |
| 16 | W. | 23 | 19. 52 | 101. 37 | 108. 20 | 24. 43 | 23. 33 |
| 17 | Th. | 24 | 20. 39 | 114. 49 | 121. 8 | 22. 6 | 20. 26 |
| 18 | F. | 25 | 21. 25 | 127. 14 | 133. 10 | 18. 34 | 16. 31 |
| 19 | Sa. | 26 | 22. 7 | 138. 57 | 144. 35 | 14. 18 | 11. 59 |
| 20 | Su. | 27 | 22. 48 | 150. 6 | 155. 31 | 9. 33 | 7. 2 |
| 21 | M. | 28 | 23. 28 | 160. 53 | 166. 12 | 4. 28 N | 1. 52 N |
| 22 | Tu. | 29 | ☌ | 171. 30 | 176. 49 | 0. 45 S | 3. 22 S |
| 23 | W. | 0 | 0. 8 | 182. 9 | 187. 33 | 5. 57 | 8. 29 |
| 24 | Th. | 1 | 0. 49 | 193. 3 | 198. 39 | 10. 57 | 13. 19 |
| 25 | F. | 2 | 1. 32 | 204. 22 | 210. 14 | 15. 35 | 17. 41 |
| 26 | Sa. | 3 | 2. 18 | 216. 17 | 222. 30 | 19. 37 | 21. 22 |
| 27 | Su. | 4 | 3. 6 | 228. 53 | 235. 28 | 22. 53 | 24. 9 |
| 28 | M. | 5 | 3. 59 | 242. 14 | 249. 9 | 25. 8 | 25. 49 |
| 29 | Tu. | 6 | 4. 53 | 256. 12 | 263. 22 | 26. 10 | 26. 10 |
| 30 | W. | 7 | 5. 50 | 270. 36 | 277. 51 | 25. 48 | 25. 5 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semid. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Tu. | 15. 24 | 15. 31 | 56. 30 | 56. 56 | 0261 | 0228 |
| 2 | W. | 15. 38 | 15. 46 | 57. 23 | 57. 51 | 0194 | 0158 |
| 3 | Th. | 15. 54 | 16. 1 | 58. 20 | 58. 49 | 0122 | 0087 |
| 4 | F. | 16. 9 | 16. 17 | 59. 17 | 59. 45 | 0052 | 0018 |
| 5 | Sa. | 16. 24 | 16. 30 | 60. 11 | 60. 34 | 9987 | 9959 |
| 6 | Su. | 16. 36 | 16. 40 | 60. 55 | 61. 11 | 9934 | 9915 |
| 7 | M. | 16. 44 | 16. 46 | 61. 23 | 61. 31 | 9901 | 9892 |
| 8 | Tu. | 16. 46 | 16. 46 | 61. 33 | 61. 30 | 9889 | 9893 |
| 9 | W. | 16. 44 | 16. 40 | 61. 23 | 61. 11 | 9901 | 9915 |
| 10 | Th. | 16. 36 | 16. 30 | 60. 54 | 60. 34 | 9935 | 9959 |
| 11 | F. | 16. 24 | 16. 17 | 60. 11 | 59. 46 | 9987 | 0017 |
| 12 | Sa. | 16. 9 | 16. 2 | 59. 19 | 58. 51 | 0050 | 0084 |
| 13 | Su. | 15. 54 | 15. 47 | 58 22 | 57. 54 | 0120 | 0155 |
| 14 | M. | 15. 39 | 15. 32 | 57. 27 | 57. 0 | 0189 | 0222 |
| 15 | Tu. | 15. 25 | 15. 19 | 56. 35 | 56. 12 | 0255 | 0284 |
| 16 | W. | 15. 13 | 15. 8 | 55. 51 | 55. 31 | 0311 | 0337 |
| 17 | Th. | 15. 3 | 14. 59 | 55. 14 | 54. 59 | 0359 | 0379 |
| 18 | F. | 14. 55 | 14. 52 | 54. 46 | 54. 34 | 0396 | 0412 |
| 19 | Sa. | 14. 49 | 14. 47 | 54. 24 | 54. 17 | 0426 | 0435 |
| 20 | Su. | 14. 46 | 14. 45 | 54. 10 | 54. 6 | 0444 | 0450 |
| 21 | M. | 14. 44 | 14. 43 | 54. 3 | 54. 2 | 0454 | 0455 |
| 22 | Tu. | 14. 43 | 14. 44 | 54. 2 | 54. 3 | 0455 | 0454 |
| 23 | W. | 14. 44 | 14. 45 | 54. 5 | 54. 9 | 0451 | 0446 |
| 24 | Th. | 14. 47 | 14. 49 | 54. 14 | 54. 21 | 0439 | 0430 |
| 25 | F. | 14. 51 | 14. 53 | 54. 29 | 54. 38 | 0419 | 0407 |
| 26 | Sa. | 14. 56 | 15. 0 | 54. 49 | 55. 1 | 0392 | 0377 |
| 27 | Su. | 15. 3 | 15. 7 | 55. 15 | 55. 30 | 0358 | 0338 |
| 28 | M. | 15. 12 | 15. 17 | 55. 48 | 56. 7 | 0315 | 0291 |
| 29 | Tu. | 15. 23 | 15. 29 | 56. 27 | 56. 49 | 0265 | 0236 |
| 30 | W. | 15. 35 | 15. 42 | 57. 13 | 57. 37 | 0206 | 0176 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | β Capricorni. | 53. 5. 19 | 51. 29. 45 | 49. 53. 51 | 48. 17. 37 |
| 2 | | 40. 11. 18 | 38. 33. 0 | 36. 54. 22 | 35. 15. 24 |
| 3 | | 77. 7. 45 | 75. 29. 12 | 73. 50. 18 | 72. 11. 3 |
| 4 | α Pegasi. | 63. 49. 34 | 62. 8. 20 | 60. 26. 52 | 58. 45. 11 |
| 5 | | 50. 14. 7 | 48. 31. 36 | 46. 49. 6 | 45. 6. 40 |
| 6 | | 76. 47. 46 | 74. 55. 54 | 73. 3. 45 | 71. 11. 20 |
| 7 | α Arietis. | 61. 45. 52 | 59. 52. 14 | 57. 58. 28 | 56. 4. 37 |
| 8 | | 46. 34. 40 | 44. 40. 42 | 42. 46. 48 | 40. 53. 1 |
| 9 | Aldebaran. | 64. 5. 38 | 62. 13. 34 | 60. 21. 51 | 58. 30. 29 |
| 10 | | 49. 18. 43 | 47. 29. 33 | 45. 40. 52 | 43. 52. 44 |
| 11 | | 35. 1. 15 | 33. 17. 6 | 31. 33. 48 | 29. 51. 27 |
| 12 | Pollux. | 62. 9. 49 | 60. 24. 51 | 58. 40. 18 | 56. 56. 15 |
| 13 | | 48. 22. 54 | 46. 41. 39 | 45. 0. 52 | 43. 20. 33 |
| 14 | Regulus. | 71. 42. 45 | 70. 3. 53 | 68. 25. 23 | 66. 47. 17 |
| 12 | | 121. 46. 3 | 120. 7. 57 | 118. 30. 17 | 116. 53. 3 |
| 13 | | 108. 53. 25 | 107. 18. 46 | 105. 44. 32 | 104. 10. 42 |
| 14 | | 96. 27. 35 | 94. 56. 7 | 93. 25. 3 | 91. 54. 20 |
| 15 | The Sun. | 84. 26. 26 | 82. 57. 53 | 81. 29. 39 | 80. 1. 43 |
| 16 | | 72. 46. 38 | 71. 20. 29 | 69. 54. 36 | 68. 28. 59 |
| 17 | | 61. 24. 33 | 60. 0. 21 | 58. 36. 22 | 57. 12. 34 |
| 18 | | 50. 16. 22 | 48. 53. 38 | 47. 31. 3 | 46. 8. 38 |
| 25 | Antares. | 38. 8. 13 | 36. 38. 17 | 35. 8. 15 | 33. 38. 7 |
| 26 | α Aquilæ | 82. 10. 45 | 80. 51. 35 | 79. 32. 25 | 78. 13. 17 |
| 27 | | 71. 37. 40 | 70. 18. 38 | 68. 59. 42 | 67. 40. 52 |
| 28 | β Capricorni. | 56. 26. 25 | 54. 52. 58 | 53. 19. 18 | 51. 45. 23 |
| 29 | | 43. 52. 19 | 42. 16. 58 | 40. 41. 23 | 39. 5. 32 |
| 30 | α Pegasi. | 81. 6. 52 | 79. 32. 3 | 77. 56. 56 | 76. 21. 33 |



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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | β Capri- | 46. 41. 2 | 45. 4. 6 | 43. 26. 50 | 41. 49. 14 |
| 2 | corni. | 33. 36. 7 | 31. 56. 32 | 30. 16. 38 | 28. 36. 25 |
| 3 | | 70. 31. 27 | 68. 51. 27 | 67. 11. 8 | 65. 30. 31 |
| 4 | α Pegaſi. | 57. 3. 16 | 55. 21. 10 | 53. 38. 57 | 51. 56. 35 |
| 5 | | 43. 24. 24 | 41. 42. 25 | 40. 0. 47 | 38. 19. 33 |
| 6 | | 69. 18. 39 | 67. 25. 44 | 65. 32. 38 | 63. 39. 21 |
| 7 | α Arietis. | 54. 10. 40 | 52. 16. 40 | 50. 22. 40 | 48. 28. 40 |
| 8 | | 38. 59. 23 | 37. 5. 56 | 35. 12. 43 | 33. 19. 45 |
| 9 | | 56. 39. 26 | 54. 48. 41 | 52. 58. 17 | 51. 8. 17 |
| 10 | Aldeba- | 42. 5. 10 | 40. 18. 11 | 38. 31. 51 | 36. 46. 11 |
| 11 | ran. | 28. 10. 10 | 26. 30. 4 | 24. 51. 20 | 23. 14. 7 |
| 12 | Pollux. | 55. 12. 36 | 53. 29. 29 | 51. 46. 49 | 50. 4. 38 |
| 13 | | 41. 40. 43 | 40. 1. 24 | 38. 22. 32 | 36. 44. 7 |
| 12 | | 115. 16. 15 | 113. 39. 54 | 112. 3. 59 | 110. 28. 29 |
| 13 | | 102. 37. 17 | 101. 4. 16 | 99. 31. 39 | 97. 59. 25 |
| 14 | | 90. 24. 1 | 88. 54. 6 | 87. 24. 32 | 85. 55. 18 |
| 15 | The Sun. | 78. 34. 7 | 77. 6. 48 | 75. 39. 48 | 74. 13. 4 |
| 16 | | 67. 3. 37 | 65. 38. 30 | 64. 13. 37 | 62. 48. 58 |
| 17 | | 55. 48. 59 | 54. 25. 34 | 53. 2. 20 | 51. 39. 16 |
| 18 | | 44. 46. 23 | 43. 24. 17 | 42. 2. 20 | 40. 40. 31 |
| 24 | Antares. | 44. 7. 15 | 42. 37. 35 | 41. 7. 52 | 39. 38. 4 |
| 25 | | 32. 7. 53 | 30. 37. 31 | 29. 7. 1 | 27. 36. 23 |
| 26 | α Aquilæ. | 76. 54. 8 | 75. 34. 58 | 74. 15. 50 | 72. 56. 44 |
| 27 | | 66. 22. 9 | 65. 3. 34 | 63. 45. 10 | 62. 26. 56 |
| 28 | δ Capri- | 50. 11. 14 | 48. 36. 52 | 47. 2. 15 | 45. 27. 24 |
| 29 | corni. | 37. 29. 26 | 35. 53. 4 | 34. 16. 27 | 32. 39. 34 |
| 30 | ε Pegaſi. | 74. 45. 51 | 73. 9. 53 | 71. 33. 37 | 69. 57. 4 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 89. 39. 28 | 91. 8. 6 | 92. 37. 6 | 94. 6. 28 |
| 2 | The Sun. | 101. 38. 49 | 103. 10. 27 | 104. 42. 29 | 106. 14. 55 |
| 3 | | 114. 3. 10 | 115. 38. 7 | 117. 13. 30 | 118. 49. 20 |
| 1 | | 47. 45. 17 | 49. 21. 4 | 50. 57. 14 | 52. 33. 46 |
| 2 | Spica ♍ | 60. 42. 14 | 62. 21. 7 | 64. 0. 25 | 65. 40. 6 |
| 3 | | 28. 15. 37 | 29. 58. 1 | 31. 40. 54 | 33. 24. 13 |
| 4 | Antares. | 42. 7. 42 | 43. 53. 44 | 45. 40. 12 | 47. 27. 5 |
| 5 | | 56. 27. 56 | 58. 17. 23 | 60. 7. 14 | 61. 57. 27 |
| 6 | ♑ Capri- | 16. 59. 54 | 18. 48. 34 | 20. 38. 0 | 22. 28. 9 |
| 7 | corni. | 31. 47. 8 | 33. 40. 6 | 35. 33. 1 | 37. 26. 43 |
| 8 | | 53. 11. 24 | 54. 42. 48 | 56. 15. 6 | 57. 48. 13 |
| 9 | α Aquilæ. | 65. 43. 20 | 67. 19. 43 | 68. 56. 23 | 70. 33. 17 |
| 10 | | 30. 51. 54 | 32. 28. 39 | 34. 6. 18 | 35. 44. 45 |
| 11 | α Pegaſi. | 44. 5. 30 | 45. 46. 32 | 47. 27. 40 | 49. 8. 50 |
| 12 | | 57. 33. 17 | 59. 13. 42 | 60. 53. 53 | 62. 33. 50 |
| 13 | | 27. 22. 34 | 29. 3. 12 | 30. 43. 32 | 32. 23. 34 |
| 14 | ε Arietis. | 40. 39. 17 | 42. 17. 28 | 43. 55. 19 | 45. 32. 52 |
| 15 | | 22. 50. 57 | 24. 18. 27 | 25. 46. 32 | 27. 15. 7 |
| 16 | Aldeba- | 34. 42. 20 | 36. 12. 9 | 37. 41. 58 | 39. 11. 48 |
| 17 | ran. | 46. 40. 19 | 48. 9. 48 | 49. 39. 11 | 51. 8. |
| 18 | | 58. 33. 48 | 60. 2. 35 | 61. 31. 17 | 62. 59. 54 |
| 19 | Pollux. | 28. 7. 23 | 29. 34. 59 | 31. 2. 38 | 32. 30. 19 |
| 20 | | 39. 49. 20 | 41. 17. 12 | 42. 45. 5 | 44. 13. 0 |
| 26 | | 37. 29. 58 | 38. 52. 50 | 40. 15. 54 | 41. 39. 7 |
| 27 | | 48. 37. 57 | 50. 2. 18 | 51. 26. 52 | 52. 51. 38 |
| 28 | The Sun. | 59. 58. 40 | 61. 24. 46 | 62. 51. 7 | 64. 17. 42 |
| 29 | | 71. 34. 36 | 73. 2. 48 | 74. 31. 18 | 76. 0. 6 |
| 30 | | 83. 28. 58 | 84. 59. 41 | 86. 30. 45 | 88. 2. 9 |



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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | The Sun. | 95. 36. 11 | 97. 6. 16 | 98. 36. 44 | 100. 7. 35 |
| 2 | | 107. 47. 45 | 109. 20. 58 | 110 54. 37 | 112. 28. 41 |
| 3 | | 120. 25. 36 | | | |
| 1 | Spica ♍ | 54. 10. 42 | 55. 48. 0 | 57. 25. 41 | 59. 3. 46 |
| 2 | | 67. 20. 13 | 69. 0. 45 | 70. 41. 42 | 72. 23. 4 |
| 3 | Antares. | 35. 8. 0 | 36. 52. 15 | 38. 36. 57 | 40. 22. 6 |
| 4 | | 49. 14. 25 | 51. 2. 10 | 52. 50. 21 | 54. 38. 56 |
| 5 | | 63. 48. 3 | 65. 38. 58 | 67. 30. 15 | 69. 21. 53 |
| 6 | β Capricorni. | 24. 18. 56 | 26. 10. 19 | 28. 2. 12 | 29. 54. 29 |
| 7 | | 39. 20. 17 | 41. 13. 59 | 43. 7. 45 | 45. 1. 29 |
| 8 | α Aquilæ. | 59. 22. 4 | 60. 56. 35 | 62. 31. 41 | 64. 7. 17 |
| 9 | | 72. 10. 21 | 73. 47. 31 | 75. 24. 45 | 77. 1. 56 |
| 10 | α Pegaſi. | 37. 23. 55 | 39. 3. 44 | 40. 44. 2 | 42. 24. 38 |
| 11 | | 50. 49. 57 | 52. 30. 59 | 54. 11. 55 | 55. 52. 41 |
| 12 | | 64. 13. 31 | 65. 52. 55 | 67. 32. 0 | 69. 10. 46 |
| 13 | α Arietis. | 34. 3. 18 | 35. 42. 46 | 37. 21. 55 | 39. 0. 45 |
| 14 | | 47. 10. 4 | 48. 46. 56 | 50. 23. 28 | 51. 59. 42 |
| 15 | Aldeba-ran. | 28. 44. 6 | 30. 13. 24 | 31. 42. 56 | 33. 12. 35 |
| 16 | | 40. 41. 39 | 42. 11. 24 | 43. 41. 6 | 45. 10. 44 |
| 17 | | 52. 37. 45 | 54. 6. 54 | 55. 35. 57 | 57. 4. 55 |
| 18 | | 64. 28. 26 | 65. 56. 53 | 67. 25. 14 | 68. 53. 31 |
| 19 | Pollux. | 33. 58. 2 | 35. 25. 49 | 36. 53. 38 | 38. 21. 28 |
| 20 | | 45. 40. 55 | 47. 8. 52 | 48. 36. 50 | 50. 4. 49 |
| 26 | The Sun. | 43. 2. 32 | 44. 26. 6 | 45. 49. 52 | 47. 13. 48 |
| 27 | | 54. 16. 36 | 55. 41. 47 | 57. 7. 11 | 58. 32. 49 |
| 28 | | 65. 44. 33 | 67. 11. 39 | 68. 39. 2 | 70. 6. 41 |
| 29 | | 77. 29. 13 | 78. 58. 40 | 80. 28. 27 | 81. 58. 32 |
| 30 | | 89. 33. 55 | 91. 6. 4 | 92. 38. 33 | 94. 11. 26 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | Th. | Remigius. |
| 2 | F. | |
| 3 | Sa. | |
| 4 | *Su.* | *16th Sunday after Trinity.* |
| 5 | M. | |
| 6 | Tu. | Faith. |
| 7 | W. | |
| 8 | Th. | |
| 9 | F. | S. Denys. [Terms begin. |
| 10 | Sa. | Oxford and Cambridge |
| 11 | *Su.* | *17th Sunday after Trinity.* |
| 12 | M. | |
| 13 | Tu. | Tranſ. of K. Edw. Conf. |
| 14 | W. | |
| 15 | Th. | |
| 16 | F. | |
| 17 | Sa. | Etheldred. |
| 18 | *Su.* | *18th Sunday after Trinity.* |
| 19 | M. | [St. Luke. |
| 20 | Tu. | |
| 21 | W. | |
| 22 | Th. | |
| 23 | F. | |
| 24 | Sa. | [Geo. III. Acceſ. Crif. |
| 25 | *Su.* | *19th Sun. after Trin.* K. |
| 26 | M. | K. Geo. III. proclaimed |
| 27 | Tu. | [1760. |
| 28 | W. | St. Simon and St. Jude. |
| 29 | Th. | |
| 30 | F. | |
| 31 | Sa. | |

## Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Full Moon — | 7. | 4. | 33 |
| Laſt Quarter — | 14. | 3. | 14 |
| New Moon — | 22. | 7. | 59 |
| Firſt Quarter — | 29. | 23. | 13 |

## Other Phenomena.

D.

4. ☾ ☌ ♒ $5^h$. 31′.
5. ☿ Stationary.
7. ☾ ♂ ♓ $19^h$. 25′.
10. ☾ ♂ Pleiadum $1^h$. 20′.
11. ♂ ♆ ♂ diff. Lat. 14′.
☾ 3 poſt ☌ ♉ $21^h$. 28′.
13. ☾ ☍ ♊ $0^h$. 0′.
15. ☾ ☌ ♋ $7^h$. 27′.
16. ♄ Stationary.
19. ☾ ☋ ♌ $4^h$. 48′.
23. ☉ enters ♎ at $3^h$. 25′.
24. ♂ ☌ ♍ diff. Lat. 58′.
☿ ☌ ♎ diff. Lat. 1°. 7′.
25. ☾ ☌ ♍ $4^h$. 50′.
☾ ☌ ♏ $8^h$. 33′.
27. ☾ ☌ ♐ $10^h$. 27′.
31. ☾ ☌ ♒ $15^h$. 2′.

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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declin. South. | Equat. of Time Sub. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | Th. | 6. 8. 7. 36 | 12. 29. 33 | 3. 11. 41 | 10. 20 | |
| 2 | F. | 6. 9. 1. 44 | 12. 33. 10 | 3. 35. 1 | 10. 39 | 19 |
| 3 | Sa. | 6. 10. 0. 53 | 12. 36. 48 | 3. 58. 18 | 10. 57 | 18 |
| 4 | Su. | 6. 11. 0. 5 | 12. 40. 27 | 4. 21. 32 | 11. 15 | 18 |
| 5 | M. | 6. 11. 59. 18 | 12. 44. 5 | 4. 44. 43 | 11. 33 | 18 |
| 6 | Tu. | 6. 12. 58. 33 | 12. 47. 44 | 5. 7. 51 | 11. 51 | 18 |
| 7 | W. | 6. 13. 57. 49 | 12. 51. 24 | 5. 30. 54 | 12. 8 | 17 |
| 8 | Th. | 6. 14. 57. 9 | 12. 55. 4 | 5. 53. 54 | 12. 24 | 16 |
| 9 | F. | 6. 15. 56. 30 | 12. 58. 44 | 6. 16. 49 | 12. 40 | 16 |
| 10 | Sa. | 6. 16. 55. 53 | 13. 2. 24 | 6. 39. 39 | 12. 56 | 16 |
| 11 | Su. | 6. 17. 55. 19 | 13. 6. 6 | 7. 2. 24 | 13. 12 | 16 |
| 12 | M. | 6. 18. 54. 47 | 13. 9. 47 | 7. 25. 2 | 13. 27 | 15 |
| 13 | Tu. | 6. 19. 54. 17 | 13. 13. 30 | 7. 47. 35 | 13. 42 | 15 |
| 14 | W. | 6. 20. 53. 49 | 13. 17. 12 | 8. 10. 2 | 13. 56 | 14 |
| 15 | Th. | 6. 21. 53. 24 | 13. 20. 56 | 8. 32. 22 | 14. 9 | 13 |
| 16 | F. | 6. 22. 53. 1 | 13. 24. 40 | 8. 54. 35 | 14. 21 | 12 |
| 17 | Sa. | 6. 23. 52. 42 | 13. 28. 24 | 9. 16. 40 | 14. 33 | 12 |
| 18 | Su. | 6. 24. 52. 24 | 13. 32. 9 | 9. 38. 38 | 14. 44 | 11 |
| 19 | M. | 6. 25. 52. 8 | 13. 35. 55 | 10. 0. 26 | 14. 55 | 11 |
| 20 | Tu. | 6. 26. 51. 55 | 13. 39. 41 | 10. 22. 7 | 15. 5 | 10 |
| 21 | W. | 6. 27. 51. 44 | 13. 43. 29 | 10. 43. 38 | 15. 15 | 10 |
| 22 | Th. | 6. 28. 51. 35 | 13. 47. 16 | 11. 5. 0 | 15. 24 | 9 |
| 23 | F. | 6. 29. 51. 28 | 13. 51. 5 | 11. 26. 12 | 15. 32 | 8 |
| 24 | Sa. | 7. 0. 51. 23 | 13. 54. 54 | 11. 47. 13 | 15. 40 | 8 |
| 25 | Su. | 7. 1. 51. 19 | 13. 58. 44 | 12. 8. 0 | 15. 47 | 7 |
| 26 | M. | 7. 2. 51. 18 | 14. 2. 34 | 12. 28. 39 | 15. 52 | 5 |
| 27 | Tu. | 7. 3. 51. 18 | 14. 6. 25 | 12. 49. 10 | 15. 57 | 5 |
| 28 | W. | 7. 4. 51. 20 | 14. 10. 17 | 13. 9. 26 | 16. 2 | 5 |
| 29 | Th. | 7. 5. 51. 23 | 14. 14. 10 | 13. 29. 28 | 16. 6 | 4 |
| 30 | F. | 7. 6. 51. 28 | 14. 18. 4 | 13. 49. 18 | 16. 10 | 4 |
| 31 | Sa. | 7. 7. 51. 34 | 14. 21. 58 | 14. 8. 54 | 16. 12 | 2 1 |

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| Days. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | ° ′ |
| 1 | 16. 2, 8 | 1. 4, 3 | 2. 27, 8 | 9. 999999 | 9. 27. 1 |
| 7 | 16. 4, 5 | 1. 4, 6 | 2. 28, 4 | 9. 999233 | 9. 26. 42 |
| 13 | 16. 6, 1 | 1. 5, 0 | 2. 28, 9 | 9. 998496 | 9. 26. 22 |
| 19 | 16. 7, 7 | 1. 5, 5 | 2. 29, 3 | 9. 997781 | 9. 26. 3 |
| 25 | 16. 9, 4 | 1. 6, 1 | 2. 29. 8 | 9. 997072 | 9. 25. 44 |

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| Days | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | | | MERCURY. | | sup. ♂ 8d. 2h. 40′. | |
| 1 | 5. 17. 51 | 5. 56 N | 6. 2. 35 | 1. 38 N | 0. 28 S | 23. 45 |
| 7 | 6. 11. 13 | 3. 58 | 6. 13. 10 | 1. 9 | 4. 8 | 0. 0 |
| ♊ 13 | 7. 1. 11 | 1. 46 | 6. 23. 20 | 0. 32 | 8. 35 | 0. 14 |
| ♊ 19 | 7. 19. 4 | 0. 25 S | 7. 3. 7 | 0. 8 S | 12. 41 | 0. 27 |
| 25 | 8. 5. 51 | 2. 25 | 7. 12. 32 | 0. 48 | 16. 23 | 0. 41 |
| | | | VENUS. | | inf. ♂ 26d. 14h. | |
| 1 | 11. 22. 38 | 3. 21 S | 7. 10. 44 | 6. 48 S | 21. 31 S | 1. 55 |
| 7 | 0. 2. 11 | 3. 14 | 7. 11. 8 | 7. 12 | 22. 0 | 1. 34 |
| ♊ 13 | 0. 11. 44 | 3. 1 | 7. 10. 8 | 7. 18 | 21. 47 | 1. 7 |
| ♊ 19 | 0. 21. 18 | 2. 43 | 7. 7. 46 | 7. 0 | 20. 44 | 0. 36 |
| 25 | 1. 0. 54 | 2. 20 | 7. 4. 25 | 6. 14 | 18. 52 | 0. 1 |
| | | | MARS. | | | |
| 1 | 5. 25. 4 | 1. 29 N | 5. 29. 57 | 0. 56 N | 0. 53 N | 23. 30 |
| 7 | 5. 27. 44 | 1. 25 | 6. 3. 50 | 0. 54 | 0. 42 S | 23. 23 |
| ♊ 13 | 6. 0. 25 | 1. 22 | 6. 7. 45 | 0. 52 | 2. 17 | 23. 15 |
| ♊ 19 | 6. 3. 6 | 1. 19 | 6. 11. 39 | 0. 50 | 3. 51 | 23. 7 |
| 25 | 6. 5. 49 | 1. 15 | 6. 15. 38 | 0. 48 | 5. 25 | 22. 59 |
| | | | JUPITER. | | | |
| 1 | 6. 3. 46 | 1. 19 N | 6. 4. 25 | 1. 6 N | 0. 45 S | 23. 46 |
| 7 | 6. 4. 13 | 1. 19 | 6. 5. 43 | 1. 7 | 1. 15 | 23. 28 |
| ♊ 13 | 6. 4. 40 | 1. 19 | 6. 7. 0 | 1. 7 | 1. 45 | 23. 11 |
| ♊ 19 | 6. 5. 7 | 1. 19 | 6. 8. 17 | 1. 7 | 2. 15 | 22. 53 |
| 25 | 6. 5. 34 | 1. 19 | 6. 9. 33 | 1. 8 | 2. 45 | 22. 35 |
| | | | SATURN. | | | |
| 1 | 2. 27. 15 | 1. 2 S | 3. 3. 36 | 1. 3 S | 22. 22 N | 17. 43 |
| 7 | 2. 27. 28 | 1. 1 | 3. 3. 44 | 1. 3 | 22. 22 | 17. 22 |
| ♊ 13 | 2. 27. 42 | 1. 0 | 3. 3. 48 | 1. 3 | 22. 22 | 17. 0 |
| ♊ 19 | 2. 27. 55 | 1. 0 | 3. 3. 48 | 1. 3 | 22. 22 | 16. 38 |
| 25 | 2. 28. 9 | 0. 59 | 3. 3. 44 | 1. 3 | 22. 22 | 16. 15 |

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JUPITER's Satellites will not be visible this Month, being too near the SUN.



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| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Th. | 9. 13. 47. 21 | 9. 20. 33. 38 | 1. 15. 3 S | 0. 39. 41 S |
| 2 | F. | 9. 27. 26. 2 | 10. 4. 24. 50 | 0. 3. 14 S | 0. 33. 47 N |
| 3 | Sa. | 10. 11. 30. 0 | 10. 18. 41. 38 | 1. 10. 51 N | 1. 47. 19 |
| 4 | Su. | 10. 25. 59. 22 | 11. 3. 22. 58 | 2. 22. 30 | 2. 55. 42 |
| 5 | M. | 11. 10. 51. 31 | 11. 18. 24. 14 | 3. 26. 16 | 3. 53. 26 |
| 6 | Tu. | 11. 26. 0. 6 | 0. 3. 37. 42 | 4. 16. 39 | 4. 35. 23 |
| 7 | W. | 0. 11. 15. 43 | 0. 18. 52. 52 | 4. 49. 10 | 4. 57. 45 |
| 8 | Th. | 0. 26. 27. 28 | 1. 3. 58. 18 | 5. 1. 2 | 4. 59. 5 |
| 9 | F. | 1. 11. 24. 11 | 1. 18. 44. 5 | 4. 52. 3 | 4. 40. 18 |
| 10 | Sa. | 1. 25. 57. 21 | 2. 3. 3. 23 | 4. 24. 6 | 4. 4. 7 |
| 11 | Su. | 2. 10. 1. 45 | 2. 16. 52. 36 | 3. 40. 48 | 3. 14. 39 |
| 12 | M. | 2. 23. 35. 57 | 3. 0. 12. 3 | 2. 46. 13 | 2. 16. 0 |
| 13 | Tu. | 3. 6. 41. 26 | 3. 13. 4. 26 | 1. 44. 33 | 1. 12. 16 |
| 14 | W. | 3. 19. 21. 47 | 3. 25. 34. 1 | 0. 39. 28 N | 0. 6. 46 N |
| 15 | Th. | 4. 1. 41. 49 | 4. 7. 45. 48 | 0. 25. 40 S | 0. 57. 29 S |
| 16 | F. | 4. 13. 46. 43 | 4. 19. 45. 11 | 1. 28. 20 | 1. 58. 0 |
| 17 | Sa. | 4. 25. 41. 48 | 5. 1. 37. 6 | 2. 26. 11 | 2. 52. 39 |
| 18 | Su. | 5. 7. 31. 41 | 5. 13. 26. 4 | 3. 17. 10 | 3. 39. 32 |
| 19 | M. | 5. 19. 20. 33 | 5. 25. 15. 36 | 3. 59. 30 | 4. 16. 55 |
| 20 | Tu. | 6. 1. 11. 39 | 6. 7. 8. 49 | 4. 31. 34 | 4. 43. 17 |
| 21 | W. | 6. 13. 7. 22 | 6. 19. 7. 34 | 4. 51. 55 | 4. 57. 19 |
| 22 | Th. | 6. 25. 9. 28 | 7. 1. 13. 9 | 4. 59. 27 | 4. 58. 11 |
| 23 | F. | 7. 7. 18. 49 | 7. 13. 26. 31 | 4. 53. 28 | 4. 45. 24 |
| 24 | Sa. | 7. 19. 36. 17 | 7. 25. 48. 18 | 4. 33. 56 | 4. 19. 5 |
| 25 | Su. | 8. 2. 2. 40 | 8. 8. 19. 24 | 4. 1. 6 | 3. 39. 59 |
| 26 | M. | 8. 14. 38. 49 | 8. 21. 0. 58 | 3. 16. 0 | 2. 49. 23 |
| 27 | Tu. | 8. 27. 26. 15 | 9. 3. 54. 41 | 2. 20. 19 | 1. 49. 15 |
| 28 | W. | 9. 10. 26. 45 | 9. 17. 2. 35 | 1. 16. 22 | 0. 42. 8 S |
| 29 | Th. | 9. 23. 42. 41 | 10. 0. 27. 8 | 0. 6. 58 S | 0. 28. 45 N |
| 30 | F. | 10. 7. 16. 18 | 10. 14. 10. 18 | 1. 4. 28 N | 1. 39. 38 |
| 31 | Sa. | 10. 21. 9. 25 | 10. 28. 13. 34 | 2. 13. 44 | 2. 46. 15 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Paſſage over Merid. | ☽'s Right Aſcen. at Noon. | ☽'s Right Aſc. at Midn. | ☽'s Declinat. at Noon. | ☽'s Declin. at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h / | ° / | ° / | ° / | ° / |
| 1 | Th. | 10 | 6. 46 | 285. 7 | 292. 21 | 24. 0 S | 22. 33 S |
| 2 | F. | 11 | 7. 41 | 299. 30 | 306. 37 | 20. 45 | 18. 38 |
| 3 | Sa. | 12 | 8. 35 | 313. 38 | 320. 34 | 16. 13 | 13. 32 |
| 4 | Su. | 13 | 9. 29 | 327. 26 | 334. 15 | 10. 38 | 7. 33 |
| 5 | M. | 14 | 10. 22 | 341. 2 | 347. 47 | 4. 19 S | 1. 1 S |
| 6 | Tu. | 15 | 11. 14 | 354. 35 | 1. 30 | 2. 20 N | 5. 39 N |
| 7 | W. | 16 | 12. 9 | 8. 28 | 15. 29 | 8. 54 | 11. 59 |
| 8 | Th. | 17 | 13. 5 | 22. 39 | 29. 57 | 14. 53 | 17. 33 |
| 9 | F. | 18 | 14. 4 | 37. 22 | 44. 53 | 19. 54 | 21. 54 |
| 10 | Sa. | 19 | 15. 3 | 52. 29 | 60. 9 | 23. 32 | 24. 47 |
| 11 | Su. | 20 | 16. 2 | 67. 47 | 75. 23 | 25. 37 | 26. 3 |
| 12 | M. | 21 | 17. 0 | 82. 52 | 90. 13 | 26. 5 | 25. 44 |
| 13 | Tu. | 22 | 17. 54 | 97. 23 | 104. 20 | 25. 2 | 24. 2 |
| 14 | W. | 23 | 18. 44 | 111. 4 | 117. 34 | 22. 43 | 21. 10 |
| 15 | Th. | 24 | 19. 31 | 123. 51 | 129. 56 | 19. 24 | 17. 25 |
| 16 | F. | 25 | 20. 14 | 135. 49 | 141. 32 | 15. 18 | 13. 3 |
| 17 | Sa. | 26 | 20. 55 | 147. 8 | 152. 36 | 10. 41 | 8. 13 |
| 18 | Su. | 27 | 21. 35 | 157. 59 | 163. 20 | 5. 42 | 3. 9 N |
| 19 | M. | 28 | 22. 14 | 168. 39 | 173. 57 | 0. 33 N | 2. 3 S |
| 20 | Tu. | 29 | 22. 55 | 179. 17 | 184. 41 | 4. 38 S | 7. 10 |
| 21 | W. | 30 | 23. 37 | 190. 9 | 195. 43 | 9. 40 | 12. 5 |
| 22 | Th. | 1 | ♂ | 201. 25 | 207. 16 | 14. 23 | 16. 34 |
| 23 | F. | 2 | 0. 23 | 213. 17 | 219. 27 | 18. 36 | 20. 25 |
| 24 | Sa. | 3 | 1. 11 | 225. 49 | 232. 21 | 22. 3 | 23. 26 |
| 25 | Su. | 4 | 2. 2 | 239. 4 | 245. 56 | 24. 32 | 25. 21 |
| 26 | M. | 5 | 2. 56 | 252. 55 | 260. 1 | 25. 50 | 25. 59 |
| 27 | Tu. | 6 | 3. 51 | 267. 9 | 274. 19 | 25. 47 | 25. 14 |
| 28 | W. | 7 | 4. 46 | 281. 28 | 288. 34 | 24. 20 | 23. 5 |
| 29 | Th. | 8 | 5. 41 | 295. 36 | 302. 33 | 21. 30 | 19. 37 |
| 30 | F. | 9 | 6. 33 | 309. 24 | 316. 9 | 17. 26 | 15. 0 |
| 31 | Sa. | 10 | 7. 24 | 322. 49 | 329. 25 | 12. 21 | 9. 30 |



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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Th. | 15. 49 | 15. 56 | 58. 3 | 58. 29 | 0143 | 0111 |
| 2 | F. | 16. 3 | 16. 10 | 58. 55 | 59. 21 | 0079 | 0047 |
| 3 | Sa. | 16. 17 | 16. 23 | 59. 46 | 60. 9 | 0017 | 9989 |
| 4 | Su. | 16. 29 | 16. 34 | 60. 30 | 60. 49 | 9964 | 9941 |
| 5 | M. | 16. 38 | 16. 41 | 61. 4 | 61. 15 | 9923 | 9910 |
| 6 | Tu. | 16. 43 | 16. 44 | 61. 22 | 61. 24 | 9902 | 9900 |
| 7 | W. | 16. 43 | 16. 41 | 61. 21 | 61. 14 | 9903 | 9912 |
| 8 | Th. | 16. 38 | 16. 33 | 61. 2 | 60. 45 | 9926 | 9946 |
| 9 | F. | 16. 28 | 16. 21 | 60. 25 | 60. 2 | 9970 | 9998 |
| 10 | Sa. | 16. 14 | 16. 7 | 59. 35 | 59. 8 | 0030 | 0063 |
| 11 | Su. | 15. 59 | 15. 51 | 58. 39 | 58. 10 | 0099 | 0135 |
| 12 | M. | 15. 43 | 15. 35 | 57. 41 | 57. 13 | 0171 | 0206 |
| 13 | Tu. | 15. 28 | 15. 21 | 56. 46 | 56. 21 | 0241 | 0273 |
| 14 | W. | 15. 15 | 15. 9 | 55. 58 | 55. 36 | 0302 | 0331 |
| 15 | Th. | 15. 4 | 14. 59 | 55. 17 | 55. 0 | 0356 | 0378 |
| 16 | F. | 14. 55 | 14. 52 | 54. 46 | 54. 34 | 0396 | 0413 |
| 17 | Sa. | 14. 50 | 14. 47 | 54. 24 | 54. 17 | 0426 | 0435 |
| 18 | Su. | 14. 46 | 14. 45 | 54. 11 | 54. 8 | 0443 | 0447 |
| 19 | M. | 14. 45 | 14. 45 | 54. 7 | 54. 7 | 0448 | 0448 |
| 20 | Tu. | 14. 46 | 14. 46 | 54. 10 | 54. 13 | 0444 | 0440 |
| 21 | W. | 14. 48 | 14. 50 | 54. 18 | 54. 25 | 0434 | 0424 |
| 22 | Th. | 14. 52 | 14. 54 | 54. 33 | 54. 41 | 0414 | 0403 |
| 23 | F. | 14. 57 | 15. 0 | 54. 51 | 55. 2 | 0390 | 0375 |
| 24 | Sa. | 15. 3 | 15. 6 | 55. 14 | 55. 26 | 0359 | 0344 |
| 25 | Su. | 15. 10 | 15. 14 | 55. 40 | 55. 54 | 0326 | 0307 |
| 26 | M. | 15. 18 | 15. 23 | 56. 10 | 56. 26 | 0287 | 0266 |
| 27 | Tu. | 15. 27 | 15. 32 | 56. 43 | 57. 1 | 0244 | 0221 |
| 28 | W. | 15. 37 | 15. 42 | 57. 19 | 57. 39 | 0199 | 0174 |
| 29 | Th. | 15. 48 | 15. 53 | 58. 0 | 58. 19 | 0147 | 0124 |
| 30 | F. | 15. 58 | 16. 4 | 58. 39 | 58. 59 | 0099 | 0074 |
| 31 | Sa. | 16. 9 | 16. 15 | 59. 18 | 59. 37 | 0051 | 0028 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 68. 20. 13 | 66. 43. 8 | 65. 5. 46 | 63. 28. 10 |
| 2 | α Pegasi. | 55. 16. 51 | 53. 38. 3 | 51. 59. 7 | 50. 20. 7 |
| 3 | | 42. 5. 13 | 40. 26. 38 | 38. 48. 21 | 37. 10. 30 |
| 4 | | 68. 21. 19 | 66. 31. 11 | 64. 40. 44 | 62. 50. 0 |
| 5 | α Arietis. | 53. 32. 26 | 51. 40. 15 | 49. 47. 54 | 47. 55. 25 |
| 6 | | 38. 31. 16 | 36. 38. 21 | 34. 45. 29 | 32. 52. 42 |
| 7 | | 56. 10. 1 | 54. 18. 14 | 52. 26. 38 | 50. 35. 16 |
| 8 | Aldebaran. | 41. 23. 32 | 39. 34. 27 | 37. 45. 55 | 35. 57. 58 |
| 9 | | 27. 9. 53 | 25. 27. 24 | 23. 46. 21 | 22. 6. 55 |
| 10 | | 53. 50. 4 | 52. 4. 0 | 50. 18. 25 | 48. 33. 20 |
| 11 | Pollux. | 39. 55. 39 | 38. 31. 41 | 36. 32. 17 | 34. 51. 28 |
| 12 | | 63. 0. 54 | 61. 21. 15 | 59. 41. 59 | 58. 3. 10 |
| 13 | Regulus. | 49. 55. 7 | 48. 18. 44 | 46. 42. 44 | 45. 7. 7 |
| 14 | | 37. 14. 23 | 35. 40. 52 | 34. 7. 41 | 32. 34. 50 |
| 12 | | 115. 16. 57 | 113. 44. 59 | 112. 13. 26 | 110. 42. 17 |
| 13 | | 103. 12. 28 | 101. 43. 41 | 100. 15. 16 | 98. 47. 13 |
| 14 | | 91. 32. 2 | 90. 5. 59 | 88. 40. 14 | 87. 14. 46 |
| 15 | The Sun. | 80. 11. 36 | 78. 47. 45 | 77. 24. 7 | 76. 0. 43 |
| 16 | | 69. 6. 45 | 67. 44. 30 | 66. 22. 24 | 65. 0. 28 |
| 17 | | 58. 12. 50 | 56. 51. 40 | 55. 30. 36 | 54. 9. 37 |
| 18 | | 47. 25. 55 | 46. 5. 21 | 44. 44. 50 | 43. 24. 23 |
| 24 | α Aquilæ | 74. 5. 55 | 72. 46. 0 | 71. 26. 9 | 70. 6. 22 |
| 25 | | 63. 29. 33 | 62. 10. 46 | 60. 52. 14 | 59. 33. 58 |
| 26 | Fomalhaut | 75. 43. 23 | 74. 16. 53 | 72. 50. 20 | 71. 23. 46 |
| 27 | | 64. 10. 50 | 62. 44. 24 | 61. 18. 5 | 59. 51. 52 |
| 28 | | 71. 27. 34 | 69. 52. 34 | 68. 17. 24 | 66. 42. 5 |
| 29 | α Pegasi. | 58. 43. 15 | 57. 7. 8 | 55. 30. 58 | 53. 54. 45 |
| 30 | | 45. 53. 31 | 44. 17. 30 | 42. 41. 41 | 41. 6. 6 |
| 31 | α Arietis. | 73. 8. 24 | 71. 23. 3 | 69. 37. 24 | 67. 51. 29 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 61. 50. 18 | 60. 12. 13 | 58. 33. 56 | 56. 55. 29 |
| 2 | α Pegasi. | 48. 41. 4 | 47. 2. 9 | 45. 22. 58 | 43. 44. 1 |
| 3 | | 35. 33. 13 | 33. 56. 36 | 32. 20. 51 | 30. 46. 10 |
| 4 | | 60. 58. 58 | 59. 7. 42 | 57. 16. 9 | 55. 24. 24 |
| 5 | α Arietis. | 46. 2. 45 | 44. 9. 57 | 42. 17. 6 | 40. 24. 13 |
| 6 | | 63. 38. 31 | 61. 46. 16 | 59. 54. 5 | 58. 1. 59 |
| 7 | Aldebaran | 48. 44. 12 | 46. 53. 27 | 45. 3. 4 | 43. 13. 5 |
| 8 | | 34. 10. 40 | 32. 24. 6 | 30. 38. 23 | 28. 53. 35 |
| 9 | | 60. 58. 55 | 59. 11. 2 | 57. 23. 36 | 55. 36. 36 |
| 10 | Pollux. | 46. 48. 45 | 45. 4. 41 | 43. 21. 9 | 41. 38. 8 |
| 11 | | 33. 11. 14 | 31. 31. 37 | 29. 52. 39 | 28. 14. 19 |
| 12 | Regulus. | 56. 24. 44 | 54. 46. 43 | 53. 9. 7 | 51. 31. 55 |
| 13 | | 43. 31. 52 | 41. 56. 58 | 40. 22. 26 | 38. 48. 14 |
| 11 | | 121. 29. 4 | 119. 55. 23 | 118. 22. 9 | 116. 49. 21 |
| 12 | | 109. 11. 33 | 107. 41. 14 | 106. 11. 17 | 104. 41. 41 |
| 13 | | 97. 19. 31 | 95. 52. 9 | 94. 25. 7 | 92. 58. 25 |
| 14 | The Sun. | 85. 49. 36 | 84. 24. 42 | 83. 0. 4 | 81. 35. 42 |
| 15 | | 74. 37. 32 | 73. 14. 33 | 71. 51. 44 | 70. 29. 9 |
| 16 | | 63. 38. 41 | 62. 17. 2 | 60. 55. 31 | 59. 34. 6 |
| 17 | | 52. 48. 44 | 51. 27. 56 | 50. 7. 11 | 48. 46. 31 |
| 18 | | 42. 3. 59 | 40. 43. 37 | 39. 23. 18 | 38. 3. 2 |
| 24 | α Aquilæ. | 68. 46. 42 | 67. 27. 9 | 66. 7. 46 | 64. 48. 34 |
| 25 | Fomal- | 81. 28. 44 | 80. 2. 31 | 78. 36. 13 | 77. 9. 50 |
| 26 | haut. | 69. 57. 10 | 68. 30. 32 | 67. 3. 56 | 65. 37. 22 |
| 27 | | 77. 45. 57 | 76. 11. 37 | 74. 37. 6 | 73. 2. 24 |
| 28 | α Pegasi. | 65. 6. 36 | 63. 30. 57 | 61. 55. 10 | 60. 19. 16 |
| 29 | | 52. 18. 29 | 50. 42. 11 | 49. 5. 54 | 47. 29. 40 |
| 30 | | 39. 30. 48 | 37. 55. 53 | 36. 21. 25 | 34. 47. 28 |
| 31 | α Arietis. | 66. 5. 16 | 64. 18. 44 | 62. 31. 55 | 60. 44. 50 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | The Sun. | 95. 44. 40 | 97. 18. 16 | 98. 52. 15 | 100. 26. 38 |
| 2 | | 108. 24. 18 | 110. 1. 0 | 111. 38. 5 | 113. 15. 34 |
| 1 | Antares. | 37. 21. 24 | 39. 2. 44 | 40. 44. 28 | 42. 26. 34 |
| 2 | | 51. 3. 4 | 52. 47. 34 | 54. 32. 28 | 56. 17. 46 |
| 3 | | 65. 10. 10 | 66. 57. 50 | 68. 45. 53 | 70. 34. 20 |
| 4 | β Capricorni. | 25. 13. 45 | 27. 2. 41 | 28. 52. 10 | 30. 42. 8 |
| 5 | | 39. 57. 43 | 41. 49. 48 | 43. 42. 10 | 45. 34. 45 |
| 6 | α Aquilæ. | 59. 45. 6 | 61. 19. 41 | 62. 54. 58 | 64. 30. 52 |
| 7 | | 72. 37. 20 | 74. 15. 35 | 75. 54. 2 | 77. 32. 39 |
| 8 | α Pegaſi. | 38. 4. 5 | 39. 46. 13 | 41. 28. 53 | 43. 11. 58 |
| 9 | | 51. 50. 35 | 53. 34. 29 | 55. 18. 19 | 57. 2. 3 |
| 10 | α Arietis. | 22. 3. 42 | 23. 48. 2 | 25. 32. 15 | 27. 16. 18 |
| 11 | | 35. 52. 38 | 37. 34. 56 | 39. 16. 53 | 40. 58. 29 |
| 12 | Aldebaran | 18. 55. 17 | 20. 22. 46 | 21. 51. 27 | 23. 21. 7 |
| 13 | | 30. 57. 22 | 32. 29. 15 | 34. 1. 10 | 35. 33. 3 |
| 14 | | 43. 11. 17 | 44. 42. 32 | 46. 13. 38 | 47. 44. 34 |
| 15 | | 55. 16. 39 | 56. 46. 33 | 58. 16. 16 | 59. 45. 50 |
| 16 | Pollux. | 25. 4. 19 | 26. 31. 47 | 27. 59. 20 | 29. 26. 56 |
| 17 | | 36. 45. 32 | 38. 13. 17 | 39. 41. 2 | 41. 8. 47 |
| 18 | Regulus. | 11. 32. 32 | 12. 58. 41 | 14. 25. 10 | 15. 51. 56 |
| 19 | | 23. 9. 11 | 24. 37. 2 | 26. 5. 0 | 27. 33. 4 |
| 20 | | 34. 54. 48 | 36. 23. 24 | 37. 52. 5 | 39. 20. 52 |
| 26 | The Sun. | 41. 53. 46 | 43. 20. 49 | 44. 48. 8 | 46. 15. 40 |
| 27 | | 53. 37. 4 | 55. 6. 1 | 56. 35. 14 | 58. 4. 42 |
| 28 | | 65. 35. 47 | 67. 6. 45 | 68. 38. 0 | 70. 9. 31 |
| 29 | | 77. 51. 18 | 79. 24. 29 | 80. 57. 56 | 82. 31. 41 |
| 30 | | 90. 24. 49 | 92. 0. 18 | 93. 36. 6 | 95. 12. 12 |
| 31 | | 103. 17. 14 | 104. 55. 7 | 106. 33. 16 | 108. 11. 44 |
| 30 | Antares. | 60. 57. 11 | 62. 40. 34 | 64. 24. 15 | 66. 8. 14 |
| 31 | | 74. 52. 44 | 76. 38. 32 | 78. 24. 37 | 80. 11. 0 |

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Diſtances of ☽'s Center from ☉, and from Stars weſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | The Sun. | 102. 1. 24 | 103. 36. 32 | 105. 12. 4 | 106. 47. 59 |
| 2 | | 114. 53. 26 | 116. 31. 40 | 118. 10. 18 | 119. 49. 16 |
| 1 | Antares. | 44. 9. 5 | 45. 51. 59 | 47. 35. 17 | 49. 18. 58 |
| 2 | | 58. 3. 28 | 59. 49. 33 | 61. 36. 2 | 63. 22. 54 |
| 3 | β Capricorni. | 18. 4. 30 | 19. 50. 46 | 21. 37. 44 | 23. 25. 25 |
| 4 | | 32. 32. 32 | 34. 23. 19 | 36. 14. 27 | 38. 5. 55 |
| 5 | α Aquilæ. | 53. 35. 19 | 55. 6. 19 | 56. 38. 20 | 58. 11. 17 |
| 6 | | 66. 7. 19 | 67. 44. 15 | 69. 21. 36 | 70. 59. 19 |
| 7 | α Pegaſi. | 31. 23. 52 | 33. 2. 21 | 34. 42. 0 | 36. 22. 37 |
| 8 | | 44. 55. 22 | 46. 39. 0 | 48. 22. 47 | 50. 6. 40 |
| 9 | | 58. 45. 40 | 60. 29. 7 | 62. 12. 21 | 63. 55. 20 |
| 10 | α Arietis. | 29. 0. 9 | 30. 43. 44 | 32. 27. 2 | 34. 10. 0 |
| 11 | | 42. 39. 43 | 44. 20. 34 | 46. 1. 1 | 47. 41. 2 |
| 12 | Aldebaran. | 24. 51. 33 | 26. 22. 33 | 27. 53. 57 | 29. 25. 35 |
| 13 | | 37. 4. 53 | 38. 36. 39 | 40. 8. 20 | 41. 39. 53 |
| 14 | | 49. 15. 19 | 50. 45. 54 | 52. 16. 19 | 53. 46. 34 |
| 15 | | 61. 15. 14 | 62. 44. 30 | 64. 13. 37 | 65. 42. 36 |
| 16 | Pollux. | 30. 54. 35 | 32. 22. 17 | 33. 50. 1 | 35. 17. 46 |
| 17 | | 42. 36. 32 | 44. 4. 17 | 45. 32. 1 | 46. 59. 46 |
| 18 | Regulus. | 17. 18. 58 | 18. 46. 15 | 20. 13. 45 | 21. 41. 24 |
| 19 | | 29. 1. 14 | 30. 29. 29 | 31. 57. 50 | 33. 26. 16 |
| 26 | The Sun. | 47. 43. 28 | 49. 11. 31 | 50. 39. 48 | 52. 8. 19 |
| 27 | | 59. 34. 23 | 61. 4. 21 | 62. 34. 34 | 64. 5. 3 |
| 28 | | 71. 41. 18 | 73. 13. 23 | 74. 45. 45 | 76. 18. 23 |
| 29 | | 84. 5. 43 | 85. 40. 3 | 87. 14. 41 | 88. 49. 36 |
| 30 | | 96. 48. 37 | 98. 25. 19 | 100. 2. 20 | 101. 39. 38 |
| 31 | | 109. 50. 29 | 111. 29. 32 | 113. 8. 51 | 114. 48. 29 |
| 30 | Antares. | 67. 52. 31 | 69. 37. 7 | 71. 22. 1 | 73. 7. 13 |
| 31 | | 81. 57. 41 | 83. 44. 38 | 85. 31. 52 | 87. 19. 24 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | *Su.* | *20th Sunday after Trinity.* |
| 2 | M. | [All Saints. |
| 3 | Tu. | On Morrow of All Souls. |
| 4 | W. | [1 ret. |
| 5 | Th. | Powder Plot. 1605. |
| 6 | F. | Leonard. Term begins. |
| 7 | Sa. | Pr. H. Fred. born 1745. |
| 8 | *Su.* | *21st Sunday after Trinity.* |
| 9 | M. | |
| 10 | Tu. | |
| 11 | W. | S. Martin. |
| 12 | Th. | On Morrow of S. Martin. |
| 13 | F. | Britius. [2 ret. |
| 14 | Sa. | [Machutus |
| 15 | *Su.* | *22d Sunday after Trinity.* |
| 16 | M. | |
| 17 | Tu. | Hugh, Bp. of Lincoln. |
| 18 | W. | In 8 Days of S. Martin. |
| 19 | Th. | [3 ret. |
| 20 | F. | Edmund, K. and Mart. |
| 21 | Sa. | [Cecilia. |
| 22 | *Su.* | *23d Sunday after Trinity.* |
| 23 | M. | S. Clement. |
| 24 | Tu. | [15 Days of S. Mar. 4 ret. |
| 25 | W. | D. of Glo. born 1743. In |
| 26 | Th. | |
| 27 | F. | |
| 28 | Sa. | Term ends. |
| 29 | *Su.* | *Advent Sunday.* [b. 1719. |
| 30 | M. | S. Andr. Prs. Dow. Wales |

## Phases of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Full Moon | 5. | 14. | 21 |
| Last Quarter | 12. | 21. | 32 |
| New Moon | 21. | 0. | 43 |
| First Quarter | 28. | 7. | 55 |

## Other Phenomena.

D.

4. ☾ ☍ ♓ $6^h$. 15′.
5. ☿ ☌ ♏ diff. Lat. 4′.
6. ☾ ☍ Pleiadum $12^h$. 6′. the most Southern eclipsed.
8. ☾ 3 post ♉ ☌ $7^h$. 20′.
9. ☾ ☌ ♊ $9^h$. 11′.
10. ☾ ☌ ♊ $0^h$. 55′.
16. ☿ Stationary.
19. ☿ ☌ Ophiuchi diff. Lat. 44′.
21. ☉ enters ♐ at $23^h$. 30′.
☿ ☌ ♏ diff. Lat. 36′.
♂ ☌ ♏ diff. Lat. 5′.
22. ☾ ☌ Ophiuchi $12^h$. 36′.
☾ ☌ ☿ $20^h$. 13′.
23. ☾ ☌ ♐ $16^h$. 3′.
27. ☾ ☌ ♒ $20^h$. 56′.
30. ♄ ☍ ♊ diff. Lat. 12



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# NOVEMBER 1767.

| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declination South. | Equat. of Time Sub. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | Su. | 7. 8. 51. 43 | 14. 25. 53 | 14. 28. 17 | 16. 13 | 1 |
| 2 | M. | 7. 9. 51. 52 | 14. 29. 48 | 14. 47. 26 | 16. 14 | 0 |
| 3 | Tu. | 7. 10. 52. 3 | 14. 33. 45 | 15. 6. 20 | 16. 14 | 1 |
| 4 | W. | 7. 11. 52. 17 | 14. 37. 43 | 15. 24. 59 | 16. 13 | 2 |
| 5 | Th. | 7. 12. 52. 31 | 14. 41. 41 | 15. 43. 23 | 16. 11 | 3 |
| 6 | F. | 7. 13. 52. 47 | 14. 45. 40 | 16. 1. 32 | 16. 8 | 3 |
| 7 | Sa. | 7. 14. 53. 4 | 14. 59. 39 | 16. 19. 25 | 16. 5 | 4 |
| 8 | Su. | 7. 15. 53. 24 | 14. 53. 40 | 16. 37. 1 | 16. 1 | 5 |
| 9 | M. | 7. 16. 53. 45 | 14. 57. 42 | 16. 54. 19 | 15. 56 | 5 |
| 10 | Tu. | 7. 17. 54. 8 | 15. 1. 43 | 17. 11. 20 | 15. 51 | 7 |
| 11 | W. | 7. 18. 54. 33 | 15. 5. 47 | 17. 28. 4 | 15. 44 | 8 |
| 12 | Th. | 7. 19. 55. 1 | 15. 9. 51 | 17. 44. 30 | 15. 36 | 9 |
| 13 | F. | 7. 20. 55. 30 | 15. 13. 56 | 18. 0. 38 | 15. 27 | 9 |
| 14 | Sa. | 7. 21. 56. 1 | 15. 18. 2 | 18. 16. 27 | 15. 18 | 10 |
| 15 | Su. | 7. 22. 56. 34 | 15. 22. 9 | 18. 31. 57 | 15. 8 | 12 |
| 16 | M. | 7. 23. 57. 10 | 15. 26. 17 | 18. 47. 7 | 14. 56 | 12 |
| 17 | Tu. | 7. 24. 57. 47 | 15. 30. 25 | 19. 1. 57 | 14. 44 | 13 |
| 18 | W. | 7. 25. 58. 25 | 15. 34. 34 | 19. 16. 27 | 14. 31 | 13 |
| 19 | Th. | 7. 26. 59. 6 | 15. 38. 44 | 19. 30. 36 | 14. 18 | 14 |
| 20 | F. | 7. 27. 59. 48 | 15. 42. 55 | 19. 44. 24 | 14. 4 | 15 |
| 21 | Sa. | 7. 29. 0. 32 | 15. 47. 7 | 19. 57. 50 | 13. 49 | 16 |
| 22 | Su. | 8. 0. 1. 16 | 15. 51. 20 | 20. 10. 54 | 13. 33 | 17 |
| 23 | M. | 8. 1. 2. 2 | 15. 55. 34 | 20. 23. 35 | 13. 16 | 17 |
| 24 | Tu. | 8. 2. 2. 50 | 15. 59. 48 | 20. 35. 54 | 12. 59 | 18 |
| 25 | W. | 8. 3. 3. 39 | 16. 4. 3 | 20. 47. 50 | 12. 41 | 20 |
| 26 | Th. | 8. 4. 4. 28 | 16. 8. 19 | 20. 59. 23 | 12. 21 | 20 |
| 27 | F. | 8. 5. 5. 18 | 16. 12. 35 | 21. 10. 32 | 12. 1 | 20 |
| 28 | Sa. | 8. 6. 6. 10 | 16. 16. 52 | 21. 21. 17 | 11. 41 | 22 |
| 29 | Su. | 8. 7. 7. 2 | 16. 21. 9 | 21. 31. 37 | 11. 19 | 21 |
| 30 | M. | 8. 8. 7. 55 | 16. 25. 28 | 21. 41. 33 | 10. 58 | 22 |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | ☊ ° ′ |
| 1 | 16. 11, 0 | 1. 6, 8 | 2. 30, 4 | 9. 996256 | 9. 25. 22 |
| 7 | 16. 12, 6 | 1. 7, 6 | 2. 30, 8 | 9. 995611 | 9. 25. 3 |
| 13 | 16. 13, 9 | 1. 8, 3 | 2. 31, 2 | 9. 995034 | 9. 24. 44 |
| 19 | 16. 15, 1 | 1. 8, 9 | 2. 31, 7 | 9. 994509 | 9. 24. 25 |
| 25 | 16. 16, 1 | 1. 9, 6 | 2. 32, 0 | 9. 994024 | 9. 24. 6 |

## Eclipses of the SATELLITES of JUPITER.

| I. Satellite. Immersions. | | II. Satellite. Immersions. | | III. Satellite. | |
|---|---|---|---|---|---|
| Days | h ′ ″ | Days | h ′ ′ | Days | h ′ ″ |
| 2 | 7. 8. 41 | 2 | 16* 8. 47 | 1 | 14. 56. 16 I |
| 4 | 1. 37. 2 | 6 | 5. 26. 10 | 1 | 17*35. 4 E |
| 5 | 20. 5. 21 | 9 | 18*43. 24 | 8 | 18. 54. 4 I |
| 7 | 14. 33. 36 | 13 | 8. 0. 23 | 8 | 21. 31. 46 E |
| 9 | 9. 1. 51 | 16 | 21. 17. 1 | 15 | 22. 51. 4 I |
| 11 | 3. 30. 3 | 20 | 10. 33. 31 | 16 | 1. 27. 40 E |
| 12 | 21. 58. 10 | 23 | 23. 49. 44 | 23 | 2. 47. 18 I |
| 14 | 16*26. 14 | 27 | 13. 5. 44 | 23 | 5. 22. 48 E |
| 16 | 10. 54. 15 | | | 30 | 6. 42. 49 I |
| 18 | 5. 22. 14 | | | 30 | 9. 17. 13 E |
| 19 | 23. 50. 11 | | | | |
| 21 | 18*18. 6 | | | IV. Satellite. | |
| 23 | 12. 45. 55 | | | | |
| 25 | 7. 13. 48 | | | 6 | 5. 37. 46 I |
| 27 | 1. 41. 31 | | | 6 | 7. 22. 42 E |
| 28 | 20. .. 15 | | | 22 | 23. 35. 20 I |
| 30 | 14. 36. 57 | | | 23 | 1. 6. 52 E |



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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | MERCURY. greatest Elong. 22d | | | | | |
| 1 | 8. 25. 5 | 4. 27 S | 7. 23. 9 | 1. 31 S | 20. 2 S | 0, 56 |
| 7 | 9. 12. 10 | 5. 50 | 8. 1. 57 | 2. 2 | 22. 34 | 1. 8 |
| 13 | 10. 0. 39 | 6. 45 | 8. 10. 23 | 2. 24 | 24. 25 | 1. 20 |
| 19 | 10. 21. 31 | 6. 57 | 8. 18. 9 | 2. 32 | 25. 28 | 1. 29 |
| 25 | 11. 15. 58 | 6. 3 | 8. 24. 35 | 2. 17 | 25. 38 | 1. 32 |
| | VENUS. | | | | | |
| 1 | 1. 12. 6 | 1. 49 S | 7. 0. 15 | 4. 48 S | 16. 4 S | 23. 15 |
| 7 | 1. 21. 44 | 1, 19 | 6, 27. 24 | 3. 19 | 13. 39 | 22. 42 |
| 13 | 2. 1. 23 | 0. 46 | 6. 25. 50 | 1. 48 | 11. 41 | 22. 15 |
| 19 | 2. 11. 2 | 0. 12 | 6. 25. 45 | 0. 26 | 10. 23 | 21. 53 |
| 25 | 2. 20. 43 | 0. 22 N | 6. 27. 3 | 0. 42 N | 9. 47 | 21. 35 |
| | MARS. | | | | | |
| 1 | 6. 9. 0 | 1. 10 N | 6. 20. 12 | 0. 45 N | 7. 13 S | 22. 46 |
| 7 | 6. 11. 44 | 1. 6 | 6. 24. 10 | 0. 43 | 8. 44 | 22. 39 |
| 13 | 6. 14. 29 | 1. 2 | 6. 28. 9 | 0. 40 | 10. 13 | 22. 30 |
| 19 | 6. 17. 15 | 0. 57 | 7. 2. 8 | 0. 37 | 11. 39 | 22. 21 |
| 25 | 6. 20. 3 | 0. 52 | 7. 6. 9 | 0. 35 | 13. 3 | 22. 11 |
| | JUPITER. | | | | | |
| 1 | 6. 6. 6 | 1. 19 N | 6. 10. 59 | 1. 9 N | 3. 19 S | 22. 14 |
| 7 | 6. 6. 34 | 1. 19 | 6. 12. 11 | 1. 9 | 3. 46 | 21. 54 |
| 13 | 6. 7. 1 | 1. 19 | 6. 13. 22 | 1. 10 | 4. 13 | 21. 33 |
| 19 | 6. 7. 28 | 1. 19 | 6. 14. 30 | 1. 10 | 4. 37 | 21. 12 |
| 25 | 6. 7. 55 | 1. 19 | 6. 15. 35 | 1. 11 | 5. 1 | 20. 51 |
| | SATURN. | | | | | |
| 1 | 2. 28. 25 | 0. 59 S | 3. 3. 34 | 1. 3 S | 22. 22 N | 15. 47 |
| 7 | 2. 28. 39 | 0. 58 | 3. 3. 20 | 1. 3 | 22. 23 | 15. 23 |
| 13 | 2. 28. 52 | 0. 58 | 3. 3. 5 | 1. 3 | 22. 23 | 14. 57 |
| 19 | 2. 29. 6 | 0. 57 | 3. 2. 45 | 1. 3 | 22. 23 | 14. 31 |
| 25 | 2. 29. 19 | 0. 57 | 3. 2. 23 | 1. 3 | 22. 24 | 14. 4 |

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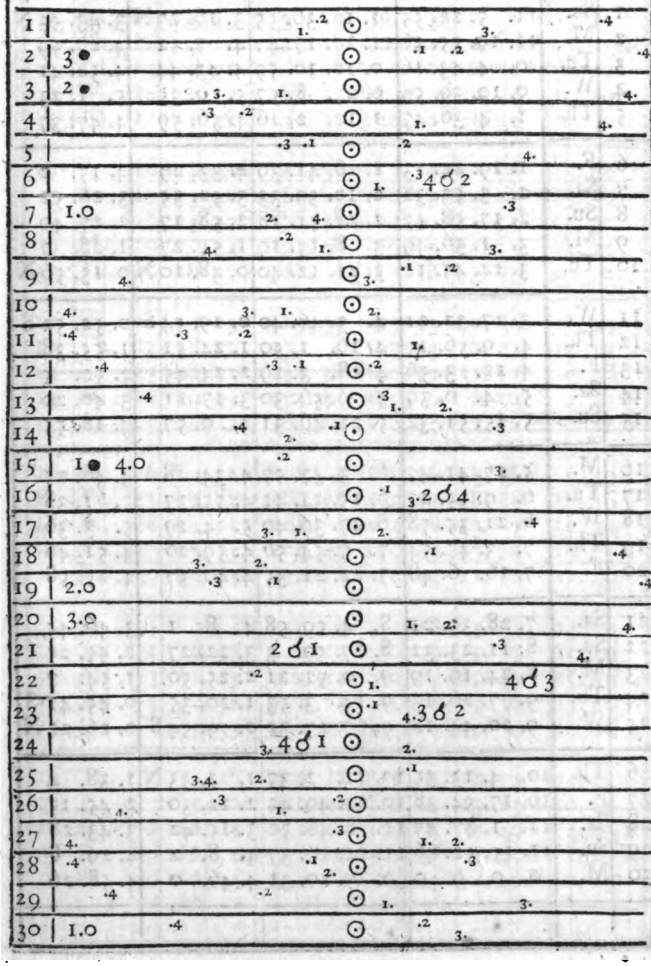
## Configurations of the SATELLITES of JUPITER at 6 o'th' Clock in the Morning.

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| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Su. | 11. 5. 22. 55 | 11. 12. 36. 55 | 3. 16. 27 N | 3. 43. 53 N |
| 2 | M. | 11. 19. 55. 26 | 11. 27. 17. 47 | 4. 7. 52 | 4. 27. 59 |
| 3 | Tu. | 0. 4. 43. 16 | 0. 12. 10. 59 | 4. 43. 44 | 4. 54. 41 |
| 4 | W. | 0. 19. 39. 59 | 0. 27. 8. 57 | 5. 0. 35 | 5. 1. 23 |
| 5 | Th. | 1. 4. 36. 47 | 1. 12. 2. 16 | 4. 56. 59 | 4. 47. 37 |
| 6 | F. | 1. 19. 24. 13 | 1. 26. 41. 39 | 4. 33. 29 | 4. 15. 0 |
| 7 | Sa. | 2. 3. 53. 38 | 2. 10. 59. 33 | 3. 52. 35 | 3. 26. 52 |
| 8 | Su. | 2. 17. 58. 53 | 2. 24. 51. 18 | 2. 58. 17 | 2. 27. 40 |
| 9 | M. | 3. 1. 36. 49 | 3. 8. 15. 19 | 1. 55. 27 | 1. 22. 7 |
| 10 | Tu. | 3. 14. 47. 12 | 3. 21. 12. 40 | 0. 48. 10 N | 0. 13. 56 N |
| 11 | W. | 3. 27. 32. 21 | 4. 3. 46. 40 | 0. 19. 54 S | 0. 52. 52 S |
| 12 | Th. | 4. 9. 56. 15 | 4. 16. 1. 50 | 1. 24. 51 | 1, 55. 38 |
| 13 | F. | 4. 22. 3. 56 | 4. 28. 3. 19 | 2. 24. 45 | 2. 52. 5 |
| 14 | Sa. | 5. 4. 0. 39 | 5. 9. 56. 30 | 3. 17. 21 | 3. 40. 20 |
| 15 | Su. | 5. 15. 51. 32 | 5. 21. 46. 31 | 4. 0. 57 | 4. 18. 55 |
| 16 | M. | 5. 27. 41. 47 | 6. 3. 37. 57 | 4. 34. 8 | 4. 46. 25 |
| 17 | Tu. | 6. 9. 35. 27 | 6. 15. 34. 41 | 4. 55. 37 | 5. 1. 38 |
| 18 | W. | 6. 21. 35. 58 | 6. 27. 39. 40 | 5. 4. 19 | 5. 3. 36 |
| 19 | Th. | 7. 3. 45. 54 | 7. 9. 54. 56 | 4. 59. 26 | 4. 51. 46 |
| 20 | F. | 7. 16. 6. 48 | 7. 22. 21. 35 | 4. 40. 37 | 4. 25. 58 |
| 21 | Sa. | 7. 28. 39. 21 | 8. 4. 59. 58 | 4. 8. 1 | 3. 46. 45 |
| 22 | Su. | 8. 11. 23. 32 | 8. 17. 50. 3 | 3. 22. 27 | 2. 55. 25 |
| 23 | M. | 8. 24. 19. 19 | 9. 0. 51. 21 | 2. 25. 50 | 1. 54. 7 |
| 24 | Tu. | 9. 7. 26. 13 | 9. 14. 3. 53 | 1. 20. 35 | 0. 45. 41 S |
| 25 | W. | 9. 20. 44. 18 | 9. 27. 27. 32 | 0. 9. 54 S | 0. 26. 22 N |
| 26 | Th. | 10. 4. 13. 35 | 10. 11. 2. 37 | 1. 2. 33 N | 1. 38. 4 |
| 27 | F. | 10. 17. 54. 38 | 10. 24. 49. 42 | 2. 12. 30 | 2, 45. 15 |
| 28 | Sa. | 11. 1. 47. 47 | 11. 8. 48. 52 | 3. 15. 42 | 3. 43. 28 |
| 29 | Su. | 11. 15. 52. 46 | 11. 22. 59. 37 | 4. 8. 2 | 4. 29. 8 |
| 30 | M. | 0. 0. 9. 0 | 0. 7. 20. 31 | 4. 46. 0 | 4. 58. 26 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Passage over Merid. | ☽'s Right Ascen. at Noon. | ☽'s Right Asc. at Midn. | ☽'s Declination at Noon. | ☽'s Declination at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h ′ | ° ′ | ° ′ | ° ′ | ° ′ |
| 1 | Su. | 11 | 8. 15 | 336. 0 | 342. 33 | 6. 30 S | 3. 23 S |
| 2 | M. | 12 | 9. 5 | 349. 7 | 355. 45 | 0. 12 | 3. 1 N |
| 3 | Tu. | 13 | 9. 57 | 2. 28 | 9. 16 | 6. 12 N | 9. 20 |
| 4 | W. | 14 | 10. 52 | 16. 12 | 23. 19 | 12. 20 | 15. 9 |
| 5 | Th. | 15 | 11. 48 | 30. 37 | 38. 2 | 17. 44 | 20. 2 |
| 6 | F. | 16 | 12. 47 | 45. 37 | 53. 19 | 21. 58 | 23. 34 |
| 7 | Sa. | 17 | 13. 48 | 61. 5 | 68. 53 | 24. 46 | 25. 32 |
| 8 | Su. | 18 | 14. 47 | 76. 38 | 84. 17 | 25. 53 | 25. 50 |
| 9 | M. | 19 | 15. 44 | 91. 46 | 99. 5 | 25. 23 | 24. 35 |
| 10 | Tu. | 20 | 16. 37 | 106. 9 | 112. 58 | 23. 27 | 22. 2 |
| 11 | W. | 21 | 17. 25 | 119. 33 | 125. 53 | 20. 22 | 18. 29 |
| 12 | Th. | 22 | 18. 10 | 132. 0 | 137. 54 | 16. 25 | 14. 13 |
| 13 | F. | 23 | 18. 53 | 143. 38 | 149. 14 | 11. 53 | 9. 28 |
| 14 | Sa. | 24 | 19. 33 | 154. 43 | 160. 6 | 6. 59 | 4. 27 N |
| 15 | Su. | 25 | 20. 12 | 165. 26 | 170. 45 | 1. 52 N | 0. 42 S |
| 16 | M. | 26 | 20. 52 | 176. 4 | 181. 26 | 3. 16 S | 5. 49 |
| 17 | Tu. | 27 | 21. 33 | 186. 51 | 192. 22 | 8. 20 | 10. 46 |
| 18 | W. | 28 | 22. 15 | 198. 1 | 203. 48 | 13. 7 | 15. 22 |
| 19 | Th. | 29 | 23. 3 | 209. 45 | 215. 53 | 17. 28 | 19. 25 |
| 20 | F. | 30 | 23. 54 | 222. 13 | 228. 43 | 21. 10 | 22. 40 |
| 21 | Sa. | 1 | ♂ | 235. 25 | 242. 18 | 23. 54 | 24. 52 |
| 22 | Su. | 2 | 0. 47 | 249. 20 | 256. 29 | 25. 31 | 25. 49 |
| 23 | M. | 3 | 1. 43 | 263. 41 | 270. 57 | 25. 47 | 25. 22 |
| 24 | Tu. | 4 | 2. 38 | 278. 11 | 285. 22 | 24. 36 | 23. 29 |
| 25 | W. | 5 | 3. 33 | 292. 27 | 299. 26 | 22. 2 | 20. 16 |
| 26 | Th. | 6 | 4. 26 | 306. 18 | 313. 3 | 18. 14 | 15. 55 |
| 27 | F. | 7 | 5. 16 | 319. 39 | 326. 11 | 13. 23 | 10. 40 |
| 28 | Sa. | 8 | 6. 5 | 332. 38 | 339. 2 | 7. 49 | 4. 49 S |
| 29 | Su. | 9 | 6. 54 | 345. 24 | 351. 48 | 1. 45 S | 1. 20 N |
| 30 | M. | 10 | 7. 43 | 358. 14 | 4. 45 | 4. 26 N | 7. 29 |

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| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Logar. at Noon. | Logistic Logar. at Mdn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Su. | 16. 20 | 16. 24 | 59. 55 | 60. 10 | 0006 | 9988 |
| 2 | M. | 16. 27 | 16. 30 | 60. 24 | 60. 35 | 9971 | 9958 |
| 3 | Tu. | 16. 32 | 16. 34 | 60. 42 | 60. 47 | 9950 | 9944 |
| 4 | W. | 16. 34 | 16. 33 | 60. 47 | 60. 44 | 9944 | 9947 |
| 5 | Th. | 16. 31 | 16. 28 | 60. 36 | 60. 25 | 9957 | 9970 |
| 6 | F. | 16. 24 | 16. 19 | 60. 10 | 59. 51 | 9988 | 0011 |
| 7 | Sa. | 16. 13 | 16. 6 | 59. 30 | 59. 6 | 0036 | 0065 |
| 8 | Su. | 15. 59 | 15. 52 | 58. 41 | 58. 15 | 0096 | 0129 |
| 9 | M. | 15. 45 | 15. 38 | 57. 48 | 57. 21 | 0162 | 0196 |
| 10 | Tu. | 15. 30 | 15. 24 | 56. 55 | 56. 30 | 0229 | 0261 |
| 11 | W. | 15. 17 | 15. 12 | 56. 7 | 55. 45 | 0291 | 0319 |
| 12 | Th. | 15. 6 | 15. 1 | 55. 26 | 55. 8 | 0344 | 0367 |
| 13 | F. | 14. 57 | 14. 54 | 54. 53 | 54. 41 | 0387 | 0403 |
| 14 | Sa. | 14. 51 | 14. 49 | 54. 31 | 54. 24 | 0416 | 0426 |
| 15 | Su. | 14. 48 | 14. 48 | 54. 19 | 54. 17 | 0432 | 0435 |
| 16 | M. | 14. 47 | 14. 48 | 54. 17 | 54. 19 | 0435 | 0432 |
| 17 | Tu. | 14. 49 | 14. 51 | 54. 24 | 54. 30 | 0426 | 0418 |
| 18 | W. | 14. 53 | 14. 56 | 54. 38 | 54. 47 | 0407 | 0395 |
| 19 | Th. | 14. 59 | 15. 2 | 54. 58 | 55. 10 | 0381 | 0365 |
| 20 | F. | 15. 5 | 15. 9 | 55. 23 | 55. 37 | 0348 | 0329 |
| 21 | Sa. | 15. 13 | 15. 17 | 55. 51 | 56. 6 | 0311 | 0292 |
| 22 | Su. | 15. 21 | 15. 25 | 56. 21 | 56. 36 | 0273 | 0253 |
| 23 | M. | 15. 30 | 15. 34 | 56. 52 | 57. 7 | 0233 | 0214 |
| 24 | Tu. | 15. 38 | 15. 42 | 57. 21 | 57. 36 | 0196 | 0177 |
| 25 | W. | 15. 45 | 15. 49 | 57. 50 | 58. 5 | 0160 | 0141 |
| 26 | Th. | 15. 53 | 15. 57 | 58. 18 | 58. 31 | 0125 | 0108 |
| 27 | F. | 16. 0 | 16. 4 | 58. 44 | 58. 57 | 0093 | 0077 |
| 28 | Sa. | 16. 7 | 16. 10 | 59. 8 | 59. 19 | 0063 | 0050 |
| 29 | Su. | 16. 12 | 16. 15 | 59. 29 | 59. 37 | 0036 | 0028 |
| 30 | M. | 16. 17 | 16. 18 | 59. 45 | 59. 50 | 0018 | 0012 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | α Arietis. | 58. 57. 29 | 57. 9. 56 | 55. 22. 9 | 53. 34. 8 |
| 2 | | 44. 30. 43 | 42. 41. 29 | 40. 52. 8 | 39. 2. 41 |
| 3 | Aldebaran. | 62. 35. 16 | 60. 45. 42 | 58. 56. 7 | 57. 6. 31 |
| 4 | | 47. 59. 0 | 46. 9. 50 | 44. 20. 53 | 42. 32. 10 |
| 5 | | 33. 33. 37 | 31. 47. 22 | 30. 1. 48 | 28. 17. 2 |
| 6 | Pollux. | 60. 19. 54 | 58. 31. 12 | 56. 42. 51 | 54. 54. 49 |
| 7 | | 46. 0. 10 | 44. 14. 25 | 42. 29. 9 | 40. 44. 21 |
| 8 | Regulus. | 68. 37. 52 | 66. 54. 10 | 65. 10. 53 | 63. 28. 2 |
| 9 | | 54. 59. 56 | 53. 19. 37 | 51. 39. 44 | 50. 0. 15 |
| 10 | | 41. 49. 9 | 40. 12. 12 | 38. 35. 38 | 36. 59. 30 |
| 11 | | 29. 4. 43 | 27. 30. 56 | 25. 57. 34 | 24. 24. 37 |
| 12 | | 16. 46. 24 | 15. 16. 13 | 13. 46. 44 | 12. 18. 5 |
| 11 | The Sun. | 111. 22. 11 | 109. 55. 40 | 108. 29. 28 | 107. 3. 35 |
| 12 | | 99. 58. 35 | 98. 34. 23 | 97. 10. 26 | 95. 46. 44 |
| 13 | | 88. 51. 38 | 87. 29. 13 | 86. 6. 58 | 84. 44. 53 |
| 14 | | 77. 56. 33 | 76. 35. 16 | 75. 14. 6 | 73. 53. 1 |
| 15 | | 67. 8. 35 | 65. 47. 48 | 64. 27. 2 | 63. 6. 18 |
| 16 | | 56. 22. 41 | 55. 1. 53 | 53. 41. 2 | 52. 20. 9 |
| 17 | | 45. 34. 51 | 44. 13. 35 | 42. 52. 12 | 41. 30. 45 |
| 23 | α Pegaſi. | 86. 58. 55 | 85. 24. 20 | 83. 49. 34 | 82. 14. 39 |
| 24 | | 74. 17. 46 | 72. 41. 58 | 71. 6. 4 | 69. 30. 4 |
| 25 | | 61. 28. 59 | 59. 52. 35 | 58. 16. 12 | 56. 39. 50 |
| 26 | | 48. 38. 44 | 47. 2. 49 | 45. 27. 9 | 43. 51. 44 |
| 27 | α Arietis. | 76. 20. 28 | 74. 37. 9 | 72. 53. 39 | 71. 10. 0 |
| 28 | | 62. 29. 24 | 60. 44. 50 | 59. 0. 7 | 57. 15. 17 |
| 29 | | 48. 29. 14 | 46. 43. 40 | 44. 57. 57 | 43. 12. 9 |
| 30 | Aldebaran | 67. 6. 7 | 65. 20. 25 | 63. 34. 38 | 61. 48. 47 |



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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | α Arietis. | 51. 45. 53 | 49. 57. 23 | 48. 8. 40 | 46. 19. 47 |
| 2 | | 69. 52. 42 | 68. 3. 30 | 66. 14. 11 | 64. 24. 46 |
| 3 | Aldebaran. | 55. 16. 54 | 53. 27. 17 | 51. 37. 45 | 49. 48. 19 |
| 4 | | 40. 43. 42 | 38. 55. 34 | 37. 7. 48 | 35. 20. 27 |
| 5 | | 26. 33. 13 | 24. 50. 34 | 23. 9. 16 | 21. 29. 27 |
| 6 | Pollux. | 53. 7. 8 | 51. 19. 48 | 49. 32. 52 | 47. 46. 19 |
| 7 | | 39. 0. 1 | 37. 16. 11 | 35. 32. 54 | 33. 50. 10 |
| 8 | | 61. 45. 34 | 60. 3. 31 | 58. 21. 54 | 56. 40. 42 |
| 9 | Regulus. | 48. 21. 13 | 46. 42. 35 | 45. 4. 21 | 43. 26. 33 |
| 10 | | 35. 23. 46 | 33. 48. 25 | 32. 13. 27 | 30. 38. 53 |
| 11 | | 22. 52. 5 | 21. 20. 1 | 19. 48. 23 | 18. 17. 10 |
| 10 | | 117. 11. 39 | 115. 43. 46 | 114. 16. 14 | 112. 49. 2 |
| 11 | | 105. 38. 0 | 104. 12. 44 | 102. 47. 44 | 101. 23. 1 |
| 12 | | 94. 23. 17 | 93. 0. 4 | 91. 37. 3 | 90. 14. 14 |
| 13 | The Sun. | 83. 22. 57 | 82. 1. 9 | 80. 39. 29 | 79. 17. 57 |
| 14 | | 72. 32. 2 | 71. 11. 6 | 69. 50. 13 | 68. 29. 23 |
| 15 | | 61. 45. 35 | 60. 24. 54 | 59. 4. 11 | 57. 43. 27 |
| 16 | | 50. 59. 12 | 49. 38. 14 | 48. 17. 10 | 46. 56. 3 |
| 22 | | | | 90. 7. 33 | 88. 33. 20 |
| 23 | | 80. 39. 34 | 79. 4. 20 | 77. 28. 56 | 75. 53. 25 |
| 24 | α Pegasi. | 67. 53. 59 | 66. 17. 49 | 64. 41. 35 | 63. 5. 19 |
| 25 | | 55. 3. 28 | 53. 27. 8 | 51. 50. 54 | 50. 14. 46 |
| 26 | | 42. 16. 35 | 40. 41. 49 | 39. 7. 28 | 37. 33. 33 |
| 27 | α Arietis. | 69. 26. 11 | 67. 42. 12 | 65. 58. 5 | 64. 13. 49 |
| 28 | | 55. 30. 19 | 53. 45. 14 | 52. 0. 1 | 50. 14. 41 |
| 29 | Aldebaran | 74. 8. 15 | 72. 22. 49 | 70. 37. 19 | 68. 51. 45 |
| 30 | | 60. 2. 53 | 58. 16. 57 | 56. 31. 1 | 54. 45. 5 |

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Distances of ☽'s Center from Stars, and from ☉ west of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | β Capricorni. | 34. 30. 51 | 36. 18. 9 | 38. 5. 46 | 39. 53. 43 |
| 2 | α Aquilæ. | 54. 43. 5 | 56. 12. 17 | 57. 42. 26 | 59. 13. 28 |
| 3 | | 66. 59. 49 | 68. 34. 54 | 70. 10. 26 | 71. 46. 24 |
| 4 | | 32. 3. 20 | 33. 41. 20 | 35. 20. 24 | 37. 0. 26 |
| 5 | α Pegasi. | 45. 31. 3[illegible] | 47. 15. 16 | 48. 59. 13 | 50. 43. 23 |
| 6 | | 59. 25. 39 | 61. 10. 6 | 62. 54. 28 | 64. 38. 42 |
| 7 | γ Arietis. | 29. 51. 33 | 31. 36. 59 | 33. 32. 11 | 35. 7. 11 |
| 8 | | 43. 47. 47 | 45. 30. 53 | 47. 13. 37 | 48. 55. 59 |
| 9 | | 26. 6. 5 | 27. 40. 5 | 29. 14. 25 | 30. 48. 57 |
| 10 | Aldebaran. | 38. 41. 34 | 40. 15. 45 | 41. 49. 45 | 43. 23. 33 |
| 11 | | 51. 9. 21 | 52. 41. 48 | 54. 14. 1 | 55. 45. 59 |
| 12 | | 63. 22. 16 | 64. 52. 51 | 66. 23. 12 | 67. 53. 22 |
| 13 | Pollux. | 33. 14. 57 | 34. 43. 27 | 36. 11. 54 | 37. 40. 19 |
| 14 | | 45. 1. 32 | 46. 29. 37 | 47. 57. 39 | 49. 25. 37 |
| 15 | | 19. 45. 0 | 21. 12. 28 | 22. 40. 4 | 24. 7. 48 |
| 16 | | 31. 27. 43 | 32. 55. 56 | 34. 24. 14 | 35. 52. 38 |
| 17 | Regulus. | 43. 16. 8 | 44. 45. 9 | 46. 14. 18 | 47. 43. 34 |
| 18 | | 55. 11. 56 | 56. 42. 4 | 58. 12. 21 | 59. 42. 48 |
| 19 | | 67. 17. 33 | 68. 49. 2 | 70. 20. 42 | 71. 52. 33 |
| 25 | | 47. 40. 41 | 49. 13. 37 | 50. 46. 44 | 52. 20. 3 |
| 26 | | 60. 9. 28 | 61. 43. 55 | 63. 18. 33 | 64. 53. 21 |
| 27 | The Sun. | 72. 50. 8 | 74. 26. 2 | 76. 2. 5 | 77. 38. 19 |
| 28 | | 85. 42. 3 | 87. 19. 17 | 88. 56. 42 | 90. 34. 16 |
| 29 | | 98. 44. 22 | 100. 22. 51 | 102. 1. 30 | 103. 40. 17 |
| 30 | | 111. 56. 17 | 113. 35. 50 | 115. 15. 30 | 116. 55. 15 |
| 29 | α Aquilæ. | 51. 22. 31 | 52. 46. 59 | 54. 12. 23 | 55. 38. 44 |
| 30 | | 63. 2. 35 | 64. 33. 21 | 66. 4. 39 | 67. 36. 27 |



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Distances of ☽'s Center from Stars, and from ☉ west of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | β Capricorni. | 41. 41. 59 | 43. 30. 35 | 45. 19. 27 | 47. 8. 34 |
| 2 | α Aquilæ. | 60. 45. 20 | 62. 17. 59 | 63. 51. 19 | 65. 25. 16 |
| 3 | | 73. 22. 47 | 74. 59. 30 | 76. 36. 30 | 78. 13. 45 |
| 4 | α Pegasi. | 38. 41. 20 | 40. 23. 2 | 42. 5. 24 | 43. 48. 17 |
| 5 | | 52. 27. 43 | 54. 12. 9 | 55. 56. 37 | 57. 41. 8 |
| 6 | α Arietis. | 22. 48. 37 | 24. 34. 29 | 26. 20. 15 | 28. 5. 57 |
| 7 | | 36. 51. 57 | 38. 36. 22 | 40. 20. 30 | 42. 4. 17 |
| 8 | | 19. 55. 50 | 21. 27. 20 | 22. 59. 36 | 24. 32. 33 |
| 9 | Aldebaran. | 32. 23. 34 | 33. 58. 11 | 35. 32. 45 | 37. 7. 13 |
| 10 | | 44. 57. 8 | 46. 30. 35 | 48. 3. 42 | 49. 36. 39 |
| 11 | | 57. 17. 43 | 58. 49. 11 | 60. 20. 26 | 61. 51. 28 |
| 12 | Pollux. | 27. 20. 44 | 28. 49. 19 | 30. 17. 53 | 31. 46. 25 |
| 13 | | 39. 8. 41 | 40. 36. 59 | 42. 5. 13 | 43. 33. 24 |
| 14 | | 13. 57. 2 | 15. 23. 44 | 16. 50. 37 | 18. 17. 43 |
| 15 | | 25. 35. 38 | 27. 3. 32 | 28. 31. 31 | 29. 59. 35 |
| 16 | Regulus. | 37. 21. 8 | 38. 49. 43 | 40. 18. 25 | 41. 47. 13 |
| 17 | | 49. 12. 58 | 50. 42. 30 | 52. 12. 10 | 53. 41. 58 |
| 18 | | 61. 13. 25 | 62. 44. 11 | 64. 15. 8 | 65. 46. 15 |
| 19 | | 73. 24. 36 | | | |
| 24 | | 41. 30. 59 | 43. 3. 6 | 44. 35. 25 | 46. 7. 57 |
| 25 | | 53. 53. 34 | 55. 27. 16 | 57. 1. 9 | 58. 35. 13 |
| 26 | The Sun. | 66. 28. 21 | 68. 3. 32 | 69. 38. 55 | 71. 14. 23 |
| 27 | | 79. 14. 44 | 80. 51. 18 | 82. 28. 3 | 84. 4. 58 |
| 28 | | 92. 12. 0 | 93. 49. 52 | 95. 27. 53 | 97. 6. 2 |
| 29 | | 105. 19. 14 | 106. 58. 18 | 108. 37. 30 | 110. 16. 49 |
| 29 | α Aquilæ. | 57. 5. 58 | 58. 34. 2 | 60. 2. 52 | 61. 32. 24 |
| 30 | | 69. 8. 43 | 70. 41. 24 | 72. 14. 27 | 73. 47. 52 |

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| Days of the Month. | Days of the Week. | Sundays, Holidays, &c. |
|---|---|---|
| 1 | Tu. | |
| 2 | W. | |
| 3 | Th. | |
| 4 | F. | |
| 5 | Sa. | |
| 6 | Su. | 2d Sunday in Advent. Ni- |
| 7 | M. | [cholas. |
| 8 | Tu. | Concept. of V. Mary. |
| 9 | W. | |
| 10 | Th. | |
| 11 | F. | |
| 12 | Sa. | |
| 13 | Su. | 3d Sunday in Advent. |
| 14 | M. | [Lucy. |
| 15 | Tu. | |
| 16 | W. | O Sap. Camb. Term ends. |
| 17 | Th. | Oxford Term ends. |
| 18 | F. | |
| 19 | Sa. | |
| 20 | Su. | 4th Sunday in Advent. |
| 21 | M. | St. Thomas. |
| 22 | Tu. | |
| 23 | W. | |
| 24 | Th. | |
| 25 | F. | Chriſtmas-Day. |
| 26 | Sa. | S. Stephen. [S. John. |
| 27 | Su. | 1ſt Sunday after Chriſtm. |
| 28 | M. | Innocents. |
| 29 | Tu. | |
| 30 | W. | |
| 31 | Th. | Silveſter. |

## Phaſes of the Moon.

| | D. | H. | ′ |
|---|---|---|---|
| Full Moon — | 5. | 2. | 6 |
| Laſt Quarter — | 12. | 18. | 26 |
| New Moon — | 20. | 16. | 15 |
| Firſt Quarter — | 27. | 15. | 40 |

## Other Phenomena.

D.

1. ☾ ♊ ☌ ♓ $14^h$ 55′.
3. ♂ ♌ ♎ diff. Lat. 9′.
   ☾ ♊ Pleiadum $22^h$ 3′.
4. ♀ ♑ ♏ diff. Lat. 55′.
5. ☾ ☽ poſt ☌ ♂ $17^h$ 28′.
6. ☾ ☌ ♊ $19^h$ 4′.
7. ☾ ☍ ♊ $10^h$ 34′.
10. ☾ ☌ ☊ $1^h$ 13′.
13. ♀ ☌ Ophiuchi diff. Lat. 12′.
18. ☾ ☌ ♍ $19^h$ 9′.
    ☾ ☌ ♏ $22^h$ 48′.
21. ☉ enters ♈ at $11^h$ 48′.
22. ♂ ☌ ♎ diff. Lat. 18′.
23. ♄ ☌ ♊ diff. Lat. 5′.
25. ☾ ☌ ☽ $2^h$ 12′.
26. ♂ ☌ ♎ diff. Lat. 9′.
28. ☾ ☌ ♓ $20^h$ 56′.
29. ♀ ☌ ♎ diff. Lat. 56′.
31. ☾ ☌ Pleiadum $5^h$ 37′.

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| Days of the Month. | Days of the Week. | Sun's Longitude. | Sun's Right Asc. in Time. | Sun's Declin. South. | Equat. of Time Sub. | Diff. |
|---|---|---|---|---|---|---|
| | | s ° ′ ″ | h ′ ″ | ° ′ ″ | ′ ″ | ″ |
| 1 | Tu. | 8. 9. 8. 48 | 16. 29. 47 | 21. 51. 3 | 10. 36 | |
| 2 | W. | 8. 10. 9. 42 | 16. 34. 7 | 22. 0. 9 | 10. 12 | 24 |
| 3 | Th. | 8. 11. 10. 38 | 16. 38. 27 | 22. 8. 49 | 9. 49 | 23 |
| 4 | F. | 8. 12. 11. 35 | 16. 42. 48 | 22. 17. 3 | 9. 24 | 25 |
| 5 | Sa. | 8. 13. 12. 32 | 16. 47. 10 | 22. 24. 51 | 9. 0 | 24 |
| 6 | Su. | 8. 14. 13. 29 | 16. 51. 32 | 22. 32. 13 | 8. 34 | 26 |
| 7 | M. | 8. 15. 14. 28 | 16. 55. 54 | 22. 39. 9 | 8. 9 | 25 |
| 8 | Tu. | 8. 16. 15. 28 | 17. 0. 17 | 22. 45. 38 | 7. 42 | 27 |
| 9 | W. | 8. 17. 16. 29 | 17. 4. 41 | 22. 51. 40 | 7. 15 | 27 |
| 10 | Th. | 8. 18. 17. 30 | 17. 9. 4 | 22. 57. 15 | 6. 47 | 28 |
| 11 | F. | 8. 19. 18. 34 | 17. 13. 29 | 23. 2. 23 | 6. 19 | 28 |
| 12 | Sa. | 8. 20. 19. 38 | 17. 17. 53 | 23. 7. 3 | 5. 51 | 28 |
| 13 | Su. | 8. 21. 20. 43 | 17. 22. 19 | 23. 11. 16 | 5. 22 | 29 |
| 14 | M. | 8. 22. 21. 49 | 17. 26. 44 | 23. 15. 1 | 4. 54 | 28 |
| 15 | Tu. | 8. 23. 22. 56 | 17. 31. 10 | 23. 18. 19 | 4. 25 | 29 |
| 16 | W. | 8. 24. 24. 4 | 17. 35. 36 | 23. 21. 8 | 3. 55 | 30 |
| 17 | Th. | 8. 25. 25. 13 | 17. 40. 2 | 23. 23. 29 | 3. 26 | 29 |
| 18 | F. | 8. 26. 26. 22 | 17. 44. 29 | 23. 25. 22 | 2. 56 | 30 |
| 19 | Sa. | 8. 27. 27. 33 | 17. 48. 55 | 23. 26. 47 | 2. 27 | 29 |
| 20 | Su. | 8. 28. 28. 43 | 17. 53. 21 | 23. 27. 43 | 1. 57 | 30 |
| 21 | M. | 8. 29. 29. 55 | 17. 57. 49 | 23. 28. 12 | 1. 26 | 31 |
| 22 | Tu. | 9. 0. 31. 6 | 18. 2. 16 | 23. 28. 12 | 0. 56 | 30 |
| 23 | W. | 9. 1. 32. 18 | 18. 6. 42 | 23. 27. 43 | 0. 26 | 30 |
| 24 | Th. | 9. 2. 33. 20 | 18. 11. 9 | 23. 26. 46 | Add 4 | 30 |
| 25 | F. | 9. 3. 34. 42 | 18. 15. 36 | 23. 25. 20 | 0. 34 | 30 |
| 26 | Sa. | 9. 4. 35. 53 | 18. 20. 3 | 23. 23. 27 | 1. 4 | 30 |
| 27 | Su. | 9. 5. 37. 5 | 18. 24. 29 | 23. 21. 5 | 1. 34 | 30 |
| 28 | M. | 9. 6. 38. 16 | 18. 28. 56 | 23. 18. 15 | 2. 3 | 29 |
| 29 | Tu. | 9. 7. 39. 27 | 18. 33. 21 | 23. 14. 57 | 2. 33 | 30 |
| 30 | W. | 9. 8. 40. 38 | 18. 37. 46 | 23. 11. 12 | 3. 2 | 29 |
| 31 | Th. | 9. 9. 41. 48 | 18. 42. 12 | 23. 6. 57 | 3. 31 | 29 |

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| Days of the Month. | Semidiameter of the Sun. | Time of D° passing the Meridian. | Hourly Motion of the Sun. | Logarithm of the Sun's Distance. | Place of the Moon's Node. |
|---|---|---|---|---|---|
| | ′ ″ | ′ ″ | ′ ″ | | s ° ′ |
| 1 | 16. 17, 1 | 1. 10, 2 | 2. 32, 2 | 9. 993587 | 9. 23. 47 |
| 7 | 16. 17, 9 | 1. 10, 6 | 2. 32, 5 | 9. 993237 | 9. 23. 28 |
| 13 | 16. 18, 5 | 1. 11, 0 | 2. 32, 7 | 9. 992979 | 9. 23. 9 |
| 19 | 16. 19, 0 | 1. 11, 1 | 2. 32, 8 | 9. 992805 | 9. 22. 50 |
| 25 | 16. 19, 2 | 1. 11, 1 | 2. 32, 9 | 9. 992684 | 9. 22. 31 |

## Eclipſes of the SATELLITES of JUPITER.

### I. Satellite. Immerſions.

| Days | h ′ ″ |
|---|---|
| 2 | 9. 4. 37 |
| 4 | 3. 32. 13 |
| 5 | 21. 59. 49 |
| 7 | 16*27. 22 |
| 9 | 10. 54. 55 |
| 11 | 5. 22. 20 |
| 12 | 23. 49. 53 |
| 14 | 18*17. 20 |
| 16 | 12. 44. 53 |
| 18 | 7. 12. 17 |
| 20 | 1. 39. 44 |
| 21 | 20. 7. 10 |
| 23 | 14. 34. 36 |
| 25 | 9. 2. 8 |
| 27 | 3. 29. 31 |
| 28 | 21. 57. 0 |
| 30 | 16*24. 27 |

### II. Satellite. Immerſions.

| Days | h ′ ″ |
|---|---|
| 1 | 2. 21. 39 |
| 4 | 15*37. 12 |
| 8 | 4. 52. 40 |
| 11 | 18* 7. 52 |
| 15 | 7. 23. 0 |
| 18 | 20. 38. 6 |
| 22 | 9. 53. 0 |
| 25 | 23. 7. 52 |
| 29 | 12. 22. 43 |

### III. Satellite.

| Days | h ′ ″ | |
|---|---|---|
| 7 | 10. 37. 41 | I |
| 7 | 13. 10. 59 | E |
| 14 | 14. 32. 4 | I |
| 14 | 17* 4. 16 | E |
| 21 | 18*26. 10 | I |
| 21 | 20. 57. 16 | E |
| 28 | 22. 20. 27 | I |
| 29 | 0. 50. 37 | E |

### IV. Satellite.

| | | |
|---|---|---|
| 9 | 17*30. 6 | I |
| 9 | 18*45. 56 | E |
| 26 | 11. 25. 8 | I |
| 26 | 12. 21. 7 | E |

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| Days. | Heliocentric Longitude. | Heliocentric Latitude. | Geocentric Longitude. | Geocentric Latitude. | Declination. | Passage over Merid. |
|---|---|---|---|---|---|---|
| | s ° ′ | ° ′ | s ° ′ | ° ′ | ° ′ | h ′ |
| | MERCURY. inf. ☌ 11d. 19h. | | | | | |
| 1 | 0. 15. 20 | 3. 33 S | 8. 28. 2 | 1. 26 S | 24. 53 S | 1. 22 |
| 7 | 1. 19. 52 | 0. 30 N | 8. 26. 1 | 0. 13 N | 23. 12 | 0. 47 |
| 13 | 2. 27. 31 | 4. 40 | 8. 18. 33 | 2. 7 | 20. 52 | 23. 41 |
| 19 | 4. 3. 35 | 6. 50 | 8. 12. 35 | 2. 59 | 19. 22 | 22. 52 |
| 25 | 5. 4. 35 | 6. 37 | 8. 12. 33 | 2. 44 | 19. 38 | 22. 28 |
| | VENUS. | | | | | |
| 1 | 3. 0. 25 | 0. 56 N | 6. 29. 31 | 1. 38 N | 9. 46 S | 21. 20 |
| 7 | 3. 10. 8 | 1. 28 | 7. 2. 59 | 2. 20 | 10. 20 | 21. 10 |
| 13 | 3. 19. 52 | 1. 58 | 7. 7. 11 | 2. 53 | 11. 11 | 21. 1 |
| 19 | 3. 29. 36 | 2. 24 | 7. 12. 1 | 3. 14 | 12. 23 | 20. 53 |
| 25 | 4. 9. 21 | 2. 46 | 7. 17. 18 | 3. 26 | 13. 43 | 20. 48 |
| | MARS. | | | | | |
| 1 | 6. 22. 52 | 0. 47 N | 7. 10. 10 | 0. 32 N | 14. 22 S | 22. 0 |
| 7 | 6. 25. 42 | 0. 41 | 7. 14. 12 | 0. 29 | 15. 40 | 21. 49 |
| 13 | 6. 28. 33 | 0. 37 | 7. 18. 16 | 0. 26 | 16. 53 | 21. 38 |
| 19 | 7. 1. 26 | 0. 32 | 7. 22. 20 | 0. 22 | 18. 2 | 21. 28 |
| 25 | 7. 4. 20 | 0. 26 | 7. 26. 26 | 0. 18 | 19. 5 | 21. 18 |
| | JUPITER. | | | | | |
| 1 | 6. 8. 22 | 1. 19 N | 6. 16. 37 | 1. 11 N | 5. 26 S | 20. 30 |
| 7 | 6. 8. 49 | 1. 19 | 6. 17. 36 | 1. 12 | 5. 48 | 20. 8 |
| 13 | 6. 9. 17 | 1. 19 | 6. 18. 31 | 1. 13 | 6. 8 | 19. 45 |
| 19 | 6. 9. 44 | 1. 19 | 6. 19. 23 | 1. 14 | 6. 27 | 19. 21 |
| 25 | 6. 10. 12 | 1. 19 | 6. 20. 9 | 1. 15 | 6. 42 | 18. 57 |
| | SATURN. | | | | ☍ 21d 19h. | |
| 1 | 2. 29. 32 | 0. 56 S | 3. 1. 58 | 1. 2 S | 22. 25 N | 13. 37 |
| 7 | 2. 29. 45 | 0. 56 | 3. 1. 31 | 1. 2 | 22. 26 | 13. 9 |
| 13 | 2. 29. 59 | 0. 55 | 3. 1. 3 | 1. 1 | 22. 27 | 12. 41 |
| 19 | 3. 0. 12 | 0. 55 | 3. 0. 34 | 1. 1 | 22. 27 | 12. 12 |
| 25 | 3. 0. 26 | 0. 54 | 3. 0. 3 | 1. 0 | 22. 28 | 11. 43 |

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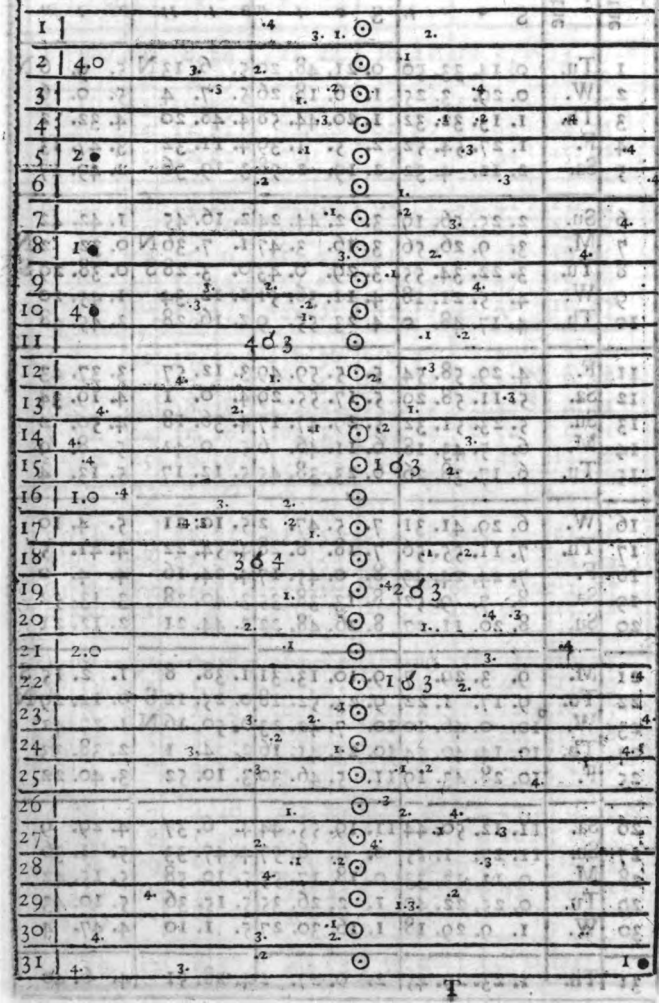
## Configurations of the SATELLITES of JUPITER at 6 o'th' Clock in the Morning.



| Days of the Month. | Days of the Week. | Moon's Longitude at Noon. | Moon's Longitude at Midnight. | Moon's Latitude at Noon. | Moon's Latitude at Midnight. |
|---|---|---|---|---|---|
| | | S ° ′ ″ | S ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Tu. | 0. 14. 33. 50 | 0. 21. 48. 20 | 5. 6. 13 N | 5. 9. 6 N |
| 2 | W. | 0. 29. 3. 25 | 1. 6. 18. 26 | 5. 7. 4 | 5. 0. 6 |
| 3 | Th. | 1. 13. 32. 32 | 1. 20. 44. 58 | 4. 48. 20 | 4. 32. 2 |
| 4 | F. | 1. 27. 54. 52 | 2. 5. 1. 39 | 4. 11. 32 | 3. 47. 13 |
| 5 | Sa. | 2. 12. 4. 32 | 2. 19. 2. 58 | 3. 19. 36 | 2. 49. 17 |
| 6 | Su. | 2. 25. 56. 19 | 3. 2. 44. 24 | 2. 16. 45 | 1. 42. 42 |
| 7 | M. | 3. 9. 26. 56 | 3. 16. 3. 47 | 1. 7. 36 N | 0. 32. 2 N |
| 8 | Tu. | 3. 22. 34. 55 | 3. 29. 0. 43 | 0. 3. 28 S | 0. 38. 29 S |
| 9 | W. | 4. 5. 21. 18 | 4. 11. 36. 51 | 1. 12. 34 | 1. 45. 20 |
| 10 | Th. | 4. 17. 48. 0 | 4. 23. 55. 9 | 2. 16. 28 | 2. 45. 48 |
| 11 | F. | 4. 29. 58. 54 | 5. 5. 59. 49 | 3. 12. 57 | 3. 37. 43 |
| 12 | Sa. | 5. 11. 58. 29 | 5. 17. 55. 29 | 4. 0. 1 | 4. 19. 34 |
| 13 | Su. | 5. 23. 51. 32 | 5. 29. 47. 17 | 4. 36. 18 | 4. 50. 2 |
| 14 | M. | 6. 5. 43. 18 | 6. 11. 46. 6 | 5. 0. 42 | 5. 8. 9 |
| 15 | Tu. | 6. 17. 38. 26 | 6. 23. 38. 45 | 5. 12. 17 | 5. 13. 4 |
| 16 | W. | 6. 29. 41. 31 | 7. 5. 47. 2 | 5. 10. 21 | 5. 4. 10 |
| 17 | Th. | 7. 11. 55. 56 | 7. 18. 8. 28 | 4. 54. 22 | 4. 41. 5 |
| 18 | F. | 7. 24. 24. 49 | 8. 0. 45. 17 | 4. 24. 16 | 4. 4. 0 |
| 19 | Sa. | 8. 7. 9. 52 | 8. 13. 38. 35 | 3. 40. 28 | 3. 13. 52 |
| 20 | Su. | 8. 20. 11. 27 | 8. 26. 48. 22 | 2. 44. 21 | 2. 12. 21 |
| 21 | M. | 9. 3. 29. 7 | 9. 10. 13. 31 | 1. 38. 8 | 1. 2. 15 S |
| 22 | Tu. | 9. 17. 1. 22 | 9. 23. 52. 18 | 0. 25. 12 S | 0. 12. 29 N |
| 23 | W. | 10. 0. 46. 10 | 10. 7. 42. 23 | 0. 50. 16 N | 1. 27. 42 |
| 24 | Th. | 10. 14. 40. 54 | 10. 21. 41. 16 | 2. 4. 1 | 2. 38. 33 |
| 25 | F. | 10. 28. 43. 19 | 11. 5. 46. 30 | 3. 10. 52 | 3. 40. 22 |
| 26 | Sa. | 11. 12. 50. 44 | 11. 19. 55. 44 | 4. 6. 37 | 4. 29. 9 |
| 27 | Su. | 11. 27. 1. 15 | 0. 4. 6. 57 | 4. 47. 33 | 5. 1. 36 |
| 28 | M. | 0. 11. 12. 33 | 0. 18. 17. 55 | 5. 10. 58 | 5. 15. 42 |
| 29 | Tu. | 0. 25. 22. 40 | 1. 2. 26. 35 | 5. 15. 36 | 5. 10. 43 |
| 30 | W. | 1. 9. 29. 18 | 1. 16. 30. 27 | 5. 1. 10 | 4. 47. 4 |
| 31 | Th. | 1. 23. 29. 45 | 2. 0. 27. 2 | 4. 28. 51 | 4. 6. 40 |

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| Days of the Month. | Days of the Week. | ☽'s Age. | ☽'s Paſſage over Merid. | ☽'s Right Aſcen. at Noon. | ☽'s Right Aſc. at Midn. | ☽'s Declination at Noon. | ☽'s Declination at Midn. |
|---|---|---|---|---|---|---|---|
| | | | h ′ | ° ′ | ° ′ | ° ′ | ° ′ |
| 1 | Tu. | 11 | 8. 34 | 11. 24 | 18. 11 | 10. 27 N | 13. 17 N |
| 2 | W. | 12 | 9. 27 | 25. 7 | 32. 14 | 15. 56 | 18. 21 |
| 3 | Th. | 13 | 10. 23 | 39. 32 | 47. 1 | 20. 30 | 22. 20 |
| 4 | F. | 14 | 11. 22 | 54. 38 | 62. 20 | 23. 49 | 24. 53 |
| 5 | Sa. | 15 | 12. 22 | 70. 5 | 77. 50 | 25. 34 | 25. 50 |
| 6 | Su. | 16 | 13. 20 | 85. 30 | 93. 1 | 25. 41 | 25. 9 |
| 7 | M. | 17 | 14. 16 | 100. 22 | 107. 30 | 24. 15 | 23. 2 |
| 8 | Tu. | 18 | 15. 6 | 114. 23 | 121. 1 | 21. 31 | 19. 45 |
| 9 | W. | 19 | 15. 53 | 127. 25 | 133. 34 | 17. 47 | 15. 38 |
| 10 | Th. | 20 | 16. 37 | 139. 32 | 145. 19 | 13. 21 | 10. 57 |
| 11 | F. | 21 | 17. 17 | 150. 56 | 156. 26 | 8. 29 | 5. 57 |
| 12 | Sa. | 22 | 17. 57 | 161. 51 | 167. 12 | 3. 23 N | 0. 48 N |
| 13 | Su. | 23 | 18. 38 | 172. 32 | 177. 53 | 1. 47 S | 4. 21 S |
| 14 | M. | 24 | 19. 18 | 183. 15 | 188. 42 | 6. 52 | 9. 21 |
| 15 | Tu. | 25 | 19. 59 | 194. 14 | 199. 54 | 11. 44 | 14. 2 |
| 16 | W. | 26 | 20. 45 | 205. 43 | 211. 42 | 16. 13 | 18. 14 |
| 17 | Th. | 27 | 21. 33 | 217. 53 | 224. 16 | 20. 5 | 21. 45 |
| 18 | F. | 28 | 22. 26 | 230. 53 | 237. 41 | 23. 10 | 24. 19 |
| 19 | Sa. | 29 | 23. 21 | 244. 40 | 251. 49 | 25. 9 | 25. 40 |
| 20 | Su. | 1 | ♂ | 259. 6 | 266. 28 | 25. 50 | 25. 38 |
| 21 | M. | 2 | 0. 18 | 273. 51 | 281. 13 | 25. 3 | 24. 5 |
| 22 | Tu. | 3 | 1. 14 | 288. 31 | 295. 43 | 22. 48 | 21. 9 |
| 23 | W. | 4 | 2. 9 | 302. 48 | 309. 44 | 19. 12 | 16. 57 |
| 24 | Th. | 5 | 3. 1 | 316. 32 | 323. 12 | 14. 28 | 11. 48 |
| 25 | F. | 6 | 3. 51 | 329 46 | 336. 13 | 8. 58 | 5. 59 S |
| 26 | Sa. | 7 | 4. 40 | 342. 36 | 348. 59 | 2. 57 S | 0. 8 N |
| 27 | Su. | 8 | 5. 27 | 355. 22 | 1. 46 | 3. 12 N | 6. 13 |
| 28 | M. | 9 | 6. 16 | 8. 15 | 14. 50 | 9. 12 | 12. 3 |
| 29 | Tu. | 10 | 7. 8 | 21. 32 | 28. 23 | 14. 43 | 17. 12 |
| 30 | W. | 11 | 8. 2 | 35. 24 | 42. 34 | 19. 25 | 21. 22 |
| 31 | Th. | 12 | 8. 57 | 49. 53 | 57. 22 | 23. 0 | 24. 17 |

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# DECEMBER 1767.

| Days of the Month. | Days of the Week. | Semidr. ☽ at Noon. | Semidr. ☽ at Midnight. | Hor. Par. ☽ at Noon. | Hor. Par. ☽ at Midnight. | Logistic Log. at Noon. | Logistic Log. at Midn. |
|---|---|---|---|---|---|---|---|
| | | ′ ″ | ′ ″ | ′ ″ | ′ ″ | | |
| 1 | Tu. | 16. 19 | 16. 20 | 59. 54 | 59. 56 | 0007 | 0005 |
| 2 | W. | 16. 20 | 16. 19 | 59. 55 | 59. 51 | 0006 | 0011 |
| 3 | Th. | 16. 17 | 16. 14 | 59. 46 | 59. 36 | 0017 | 0029 |
| 4 | F. | 16. 11 | 16. 8 | 59. 25 | 59. 11 | 0042 | 0059 |
| 5 | Sa. | 16. 3 | 15. 58 | 58. 54 | 58. 37 | 0080 | 0101 |
| 6 | Su. | 15. 53 | 15. 47 | 58. 17 | 57. 55 | 0126 | 0153 |
| 7 | M. | 15. 41 | 15. 35 | 57. 33 | 57. 11 | 0181 | 0209 |
| 8 | Tu. | 15. 29 | 15. 23 | 56. 48 | 56. 26 | 0238 | 0266 |
| 9 | W. | 15. 17 | 15. 12 | 56. 5 | 55. 46 | 0293 | 0318 |
| 10 | Th. | 15. 7 | 15. 2 | 55. 28 | 55. 12 | 0341 | 0362 |
| 11 | F. | 14. 59 | 14. 55 | 54. 58 | 54. 46 | 0381 | 0396 |
| 12 | Sa. | 14. 53 | 14. 51 | 54. 36 | 54. 30 | 0410 | 0418 |
| 13 | Su. | 14. 50 | 14. 49 | 54. 26 | 54. 24 | 0423 | 0426 |
| 14 | M. | 14. 50 | 14. 51 | 54. 25 | 54. 29 | 0424 | 0419 |
| 15 | Tu. | 14. 52 | 14. 55 | 54. 35 | 54. 43 | 0411 | 0400 |
| 16 | W. | 14. 57 | 15. 1 | 54. 53 | 55. 6 | 0387 | 0370 |
| 17 | Th. | 15. 5 | 15. 9 | 55. 21 | 55. 36 | 0350 | 0331 |
| 18 | F. | 15. 14 | 15. 18 | 55. 53 | 56. 11 | 0309 | 0285 |
| 19 | Sa. | 15. 23 | 15. 29 | 56. 29 | 56. 48 | 0262 | 0238 |
| 20 | Su. | 15. 34 | 15. 39 | 57. 7 | 57. 25 | 0214 | 0191 |
| 21 | M. | 15. 44 | 15. 48 | 57. 43 | 58. 0 | 0169 | 0147 |
| 22 | Tu. | 15. 52 | 15. 56 | 58. 15 | 58. 29 | 0129 | 0111 |
| 23 | W. | 16. 0 | 16. 3 | 58. 42 | 58. 53 | 0095 | 0082 |
| 24 | Th. | 16. 5 | 16. 7 | 59. 2 | 59. 10 | 0071 | 0061 |
| 25 | F. | 16. 9 | 16. 10 | 59. 16 | 59. 21 | 0053 | 0047 |
| 26 | Sa. | 16. 11 | 16. 12 | 59. 24 | 59. 26 | 0044 | 0041 |
| 27 | Su. | 16. 12 | 16. 12 | 59. 27 | 59. 26 | 0040 | 0041 |
| 28 | M. | 16. 11 | 16. 11 | 59. 25 | 59. 22 | 0042 | 0046 |
| 29 | Tu. | 16. 10 | 16. 8 | 59. 19 | 59. 13 | 0050 | 0057 |
| 30 | W. | 16. 6 | 16. 4 | 59. 6 | 58. 59 | 0066 | 0074 |
| 31 | Th. | 16. 2 | 15. 59 | 58. 50 | 58. 40 | 0085 | 0098 |

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Distances of ☽'s Center from Stars, and from ☉ east of her.

| Days | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Aldebaran. | 52. 59. 10 | 51. 13. 19 | 49. 27. 30 | 47. 41. 44 |
| 2 | | 38. 55. 3 | 37. 10. 22 | 35. 26. 1 | 33. 42. 2 |
| 3 | Pollux. | 66. 7. 54 | 64. 20. 43 | 62. 33. 41 | 60. 46. 48 |
| 4 | | 51. 54. 56 | 50. 9. 9 | 48. 23. 37 | 46. 38. 21 |
| 5 | | 74. 32. 6 | 72. 47. 8 | 71. 2. 28 | 69. 18. 4 |
| 6 | | 60. 40. 40 | 58. 58. 7 | 57. 15. 54 | 55. 34. 0 |
| 7 | Regulus. | 47. 9. 41 | 45. 29. 54 | 43. 50. 30 | 42. 11. 28 |
| 8 | | 34. 1. 59 | 32. 25. 12 | 30. 48. 49 | 29. 12. 50 |
| 9 | | 21. 19. 14 | 19. 45. 57 | 18. 13. 13 | 16. 41. 3 |
| 10 | | 62. 45. 28 | 61. 13. 15 | 59. 41. 19 | 58. 9. 40 |
| 11 | Spica ♍ | 50. 34. 53 | 49. 4. 34 | 47. 34. 27 | 46. 4. 31 |
| 12 | | 38. 37. 30 | 37. 8. 34 | 35. 39. 46 | 34. 11. 6 |
| 10 | | 120. 27. 54 | 119. 3. 19 | 117. 38. 59 | 116. 14. 54 |
| 11 | | 109. 17. 46 | 107. 54. 57 | 106. 32. 19 | 105. 9. 52 |
| 12 | | 98. 19. 56 | 96. 58. 21 | 95. 36. 52 | 94. 15. 29 |
| 13 | | 87. 29. 40 | 86. 8. 39 | 84. 47. 39 | 83. 26. 40 |
| 14 | The Sun. | 76. 41. 40 | 75. 20. 35 | 73. 59. 57 | 72. 38. 15 |
| 15 | | 65. 50. 53 | 64. 29. 5 | 63. 7. 9 | 61. 45. 5 |
| 16 | | 54. 52. 27 | 53. 29. 25 | 52. 6. 13 | 50. 42. 49 |
| 17 | | 43. 42. 31 | 42. 17. 45 | 40. 52. 44 | |
| 23 | α Pegasi. | 51. 52. 9 | 50. 13. 46 | 48. 35. 33 | 46. 57. 31 |
| 24 | | 38. 52. 6 | 37. 16. 29 | 35. 41. 34 | 34. 7. 25 |
| 25 | α Arietis. | 65. 31. 49 | 63. 46. 28 | 62. 1. 6 | 60. 15. 42 |
| 26 | | 51. 28. 28 | 49. 43. 0 | 47. 57. 34 | 46. 12. 10 |
| 27 | | 70. 11. 45 | 68. 27. 12 | 66. 42. 42 | 64. 58. 16 |
| 28 | Aldebaran. | 56. 17. 12 | 54. 33. 15 | 52. 49. 27 | 51. 5. 46 |
| 29 | | 42. 29. 57 | 40. 47. 26 | 39. 5. 12 | 37. 23. 16 |
| 30 | | 28. 59. 59 | 27. 21. 9 | 25. 43. 10 | 24. 6. 8 |
| 31 | Pollux. | 56. 16. 50 | 54. 33. 28 | 52. 50. 16 | 51. 7. 14 |

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Diſtances of ☽'s Center from Stars, and from ☉ eaſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | Aldebaran | 45. 56. 3 | 44. 10. 31 | 42. 25. 11 | 40. 40. 1 |
| 2 | | 31. 58. 29 | 30. 15. 30 | 28. 33. 10 | 26. 51. 35 |
| 3 | Pollux. | 59. 0. 3 | 57. 13. 29 | 55. 27. 6 | 53. 40. 55 |
| 4 | | 44. 53. 21 | 43. 8. 39 | 41. 24. 17 | 39. 40. 15 |
| 5 | | 67. 33. 59 | 65. 50. 12 | 64. 6. 43 | 62. 23. 32 |
| 6 | Regulus. | 53. 52. 26 | 52. 11. 13 | 50. 30. 21 | 48. 49. 50 |
| 7 | | 40. 32. 48 | 38. 54. 31 | 37. 16. 38 | 35. 39. 7 |
| 8 | | 27. 37. 15 | 26. 2. 4 | 24. 27. 19 | 22. 53. 2 |
| 9 | | 68. 57. 1 | 67. 23. 41 | 65. 50. 40 | 64. 17. 56 |
| 10 | Spica ♍ | 56. 38. 16 | 55. 7. 5 | 53. 36. 8 | 52. 5. 24 |
| 11 | | 44. 34. 47 | 43. 5. 13 | 41. 35. 49 | 40. 6. 35 |
| 12 | | 32. 42. 33 | 31. 14. 7 | 29. 45. 48 | 28. 17. 34 |
| 10 | | 114. 51. 2 | 113. 27. 24 | 112. 3. 59 | 110. 40. 46 |
| 11 | | 103. 47. 35 | 102. 25. 28 | 101. 3. 29 | 99. 41. 39 |
| 12 | | 92. 54. 12 | 91. 32. 59 | 90. 11. 49 | 88. 50. 43 |
| 13 | The Sun. | 82. 5. 42 | 80. 44. 44 | 79. 23. 44 | 78. 2. 43 |
| 14 | | 71. 16. 58 | 69. 55. 36 | 68. 34. 8 | 67. 42. 33 |
| 15 | | 60. 22. 53 | 59. 0. 32 | 57. 38. 1 | 56. 15. 19 |
| 16 | | 49. 19. 13 | 47. 55. 24 | 46. 31. 21 | 45. 7. 3 |
| 22 | α Pegaſi. | 58. 26. 42 | 56. 47. 59 | 55. 9. 18 | 53. 30. 41 |
| 23 | | 45. 19. 43 | 43. 42. 13 | 42. 5. 4 | 40. 28. 20 |
| 24 | | 72. 32. 50 | 70. 47. 37 | 69. 2. 23 | 67. 17. 7 |
| 25 | α Arietis. | 58. 30. 17 | 56. 44. 50 | 54. 59. 23 | 53. 13. 56 |
| 26 | | 44. 26. 47 | 42. 41. 27 | 40. 56. 11 | 39. 10. 57 |
| 27 | | 63. 13. 53 | 61. 29. 35 | 59. 45. 22 | 58. 1. 14 |
| 28 | Aldebaran | 49. 22. 14 | 47. 38. 53 | 45. 55. 42 | 44. 12. 43 |
| 29 | | 35. 41. 40 | 34. 0. 28 | 32. 19. 45 | 30. 39. 33 |
| 30 | Pollux. | 63. 11. 33 | 61. 27. 43 | 59. 43. 58 | 58. 0. 20 |
| 31 | | 49. 24. 22 | 47. 41. 43 | 45. 59. 17 | 44. 17. 4 |

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Diſtances of ☽'s Center from Stars, and from ☉ weſt of her.

| Days. | Stars Names. | Noon. | 3 Hours. | 6 Hours. | 9 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 27. 39. 29 | 29. 10. 18 | 30. 42. 42 | 32. 16. 34 |
| 2 | α Pegaſi. | 40. 22. 41 | 42. 2. 18 | 43. 42. 30 | 45. 23. 10 |
| 3 | | 53. 51. 40 | 55. 34. 4 | 57. 16. 36 | 58. 59. 14 |
| 4 | α Arietis. | 23. 59. 55 | 25. 44. 37 | 27. 29. 22 | 29. 14. 6 |
| 5 | | 37. 56. 54 | 39. 41. 3 | 41. 25. 0 | 43. 8. 45 |
| 6 | | 20. 51. 26 | 22. 24. 19 | 23. 58. 2 | 25. 32. 26 |
| 7 | Aldebaran | 33. 30. 26 | 35. 6. 28 | 36. 42. 29 | 38. 18. 27 |
| 8 | | 46. 16. 11 | 47. 51. 12 | 49. 25. 59 | 51. 0. 33 |
| 9 | | 58. 49. 46 | 60. 22. 48 | 61. 55. 35 | 63. 28. 7 |
| 10 | Pollux. | 27. 9. 49 | 30. 37. 49 | 32. 7. 46 | 33. 37. 38 |
| 11 | | 41. 5. 32 | 42. 34. 47 | 44. 3. 55 | 45. 32. 57 |
| 12 | | 15. 59. 8 | 17. 26. 35 | 18. 54. 7 | 20. 21. 46 |
| 13 | | 27. 41. 11 | 29. 9. 13 | 30. 37. 17 | 32. 5. 24 |
| 14 | Regulus. | 39. 26. 36 | 40. 55. 1 | 42. 23. 30 | 43. 52. 4 |
| 15 | | 51. 16. 28 | 52. 45. 44 | 54. 15. 8 | 55. 44. 40 |
| 16 | | 63. 14. 43 | 64. 45. 16 | 66. 16. 0 | 67. 46. 56 |
| 17 | Spica ♍ | 21. 28. 31 | 23. 0. 0 | 24. 31. 52 | 26. 4. 4 |
| 18 | | 33. 49. 52 | 35. 23. 59 | 36. 58. 25 | 38. 33. 9 |
| 24 | | 42. 9. 52 | 43. 47. 20 | 45. 24. 55 | 47. 2. 36 |
| 25 | | 55. 12. 18 | 56. 50. 25 | 58. 28. 34 | 60. 6. 46 |
| 26 | The Sun. | 68. 18. 22 | 69. 56. 47 | 71. 35. 12 | 73. 13. 39 |
| 27 | | 81. 25. 59 | 83. 4. 27 | 84. 42. 54 | 86. 21. 20 |
| 28 | | 94. 33. 10 | 96. 11. 28 | 97. 49. 45 | 99. 27. 59 |
| 29 | | 107. 38. 36 | 109. 16. 35 | 110. 54. 31 | 112. 32. 24 |
| 28 | α Aquilæ. | 72. 24. 7 | 73. 55. 55 | 75. 27. 54 | 77. 0. 4 |
| 29 | | 36. 59. 42 | 38. 35. 38 | 40. 12. 11 | 41. 49. 16 |
| 30 | α Pegaſi. | 50. 0. 44 | 51. 39. 54 | 53. 19. 15 | 54. 58. 46 |
| 31 | | 63. 17. 49 | 64. 57. 50 | 66. 37. 51 | 68. 17. 51 |

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Diſtances of ☽'s Center from Stars, and from ☉ weſt of her.

| Days. | Stars Names. | 12 Hours. | 15 Hours. | 18 Hours. | 21 Hours. |
|---|---|---|---|---|---|
| | | ° ′ ″ | ° ′ ″ | ° ′ ″ | ° ′ ″ |
| 1 | | 33. 51. 45 | 35. 28. 6 | 37. 5. 29 | 38. 43. 42 |
| 2 | α Pegaſi. | 47. 4. 15 | 48. 45. 42 | 50. 27. 27 | 52. 9. 27 |
| 3 | | 60. 41. 57 | 62. 24. 42 | 64. 7. 28 | 65. 50. 12 |
| 4 | | 30. 58. 50 | 32. 43. 31 | 34. 28. 6 | 36. 12. 34 |
| 5 | α Arietis. | 44. 52. 17 | 46. 35. 34 | 48. 18. 36 | 50. 1. 20 |
| 6 | | 27. 7. 23 | 28. 42. 46 | 30. 18. 28 | 31. 54. 24 |
| 7 | Aldeba- | 39. 54. 19 | 41. 30. 2 | 43. 5. 35 | 44. 40. 58 |
| 8 | ran. | 52. 34. 54 | 54. 9. 0 | 55. 42. 51 | 57. 16. 26 |
| 9 | | 65. 0. 23 | 66. 32. 25 | 68. 4. 12 | 69. 35. 44 |
| 10 | Pollux. | 35. 7. 24 | 36. 37. 5 | 38. 6. 40 | 39. 36. 9 |
| 11 | | 47. 1. 52 | 48. 30. 39 | 49. 59. 21 | 51. 27. 58 |
| 12 | | 21. 49. 30 | 23. 17. 20 | 24. 45. 14 | 26. 13. 11 |
| 13 | Regulus. | 33. 33. 33 | 35. 1. 44 | 36. 29. 58 | 37. 58. 15 |
| 14 | | 45. 20. 43 | 46. 49. 29 | 48. 18. 22 | 49. 47. 21 |
| 15 | | 57. 14. 20 | 58. 44. 10 | 60. 14. 11 | 61. 44. 21 |
| 16 | | 15. 26. 44 | 16. 56. 32 | 18. 26. 47 | 19. 57. 27 |
| 17 | Spica ♍ | 27. 36. 36 | 29. 9. 26 | 30. 42. 35 | 32. 16. 4 |
| 18 | | 40. 8. 12 | 41. 43. 33 | 43. 19. 11 | 44. 55. 7 |
| 24 | | 48. 40. 23 | 50. 18. 15 | 51. 56. 12 | 53. 34. 13 |
| 25 | | 61. 45. 1 | 63. 23. 18 | 65. 1. 38 | 66. 39. 59 |
| 26 | The Sun. | 74. 52. 6 | 76. 30. 34 | 78. 9. 2 | 79. 47. 31 |
| 27 | | 87. 59. 45 | 89. 38. 8 | 91. 16. 30 | 92. 54. 51 |
| 28 | | 101. 6. 12 | 102. 44. 22 | 104. 22. 29 | 106. 0. 34 |
| 29 | | 114. 10. 13 | 115. 47. 58 | 117. 25. 39 | 119. 3. 16 |
| 27 | α Aquilæ. | 66. 19. 38 | 67. 50. 18 | 69. 21. 17 | 70. 52. 34 |
| 28 | | 78. 32. 24 | 80. 4. 51 | 81. 37. 24 | 83. 10. 1 |
| 29 | | 43. 26. 49 | 45. 4. 48 | 46. 43. 9 | 48. 21. 48 |
| 30 | α Pegaſi. | 56. 38. 24 | 58. 18. 8 | 59. 57. 57 | 61. 37. 51 |
| 31 | | 69. 57. 51 | 71. 37. 47 | 73. 17. 39 | 74. 57. 25 |

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# EXPLANATION and USE

## OF THE

# ARTICLES

## Contained in the

## ASTRONOMICAL and NAUTICAL EPHEMERIS.

IT may be proper firſt to premiſe, that all the Calculations are made according to apparent Time by the Meridian of the Royal Obſervatory at Greenwich. They are likewiſe adapted to apparent Noon, except where they are otherwiſe diſtinguiſhed, as the Eclipſes and Configurations of Jupiter's Satellites, the Moon's Places, &c, computed for Midnight, and the Diſtances of the Moon from the Sun and Stars for every third Hour; which are all computed to the apparent Times ſet down.

Apparent Time is that deduced immediately from the Sun, whether from the Obſervation of his paſſing the Meridian, from his Altitude obſerved at a Diſtance from the Meridian, or from his obſerved Riſing or Setting. This Time is different from that ſhewn by Clocks and Watches well regulated at Land, which is called equated or mean Time. This will be explained when we come to treat of the Equation of Time.

The Day is here ſuppoſed, according to the Method of Aſtronomers, to begin at Noon, or 12 Hours later than the civil Day of the ſame Denomination, and to be counted up to 24 Hours, or the ſucceeding Noon, when the next Day begins. Thus the Day of the Month and the Hour of the Day are the ſame in this Method as in the civil Account at Noon, and from Noon till Midnight; but from Midnight till Noon they

 differ;

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differ; for whereas in the civil Account a freſh Day is ſuppoſed to begin at Midnight, and the Hours to begin over again, in this Method the Day is ſtill continued beyond Midnight, and the Reckoning of the Hours is continued up to 24. Thus the Diſtances put down to January 10, 15 Hours, belong to January 11 at Three in the Morning by civil Reckoning.

There are 12 Pages for every Month. The firſt Column of the firſt Page of each Month contains the Day of the Month; the Second, the Day of the Week expreſſed conciſely by the initial Letter or Letters, *Su.* ſtanding for Sunday, M. for Monday, Tu. for Tueſday, W. for Wedneſday, Th. for Thurſday, F. for Friday, and Sa. for Saturday: The third Column exhibits the Sundays and Feſtivals of the Church of England, and other remarkable Days: The laſt Column ſhews at Top the Moon's Phaſes, or the Times of new and full Moon, and of the firſt and laſt Quarter, or two Quadratures with the Sun: Beneath are contained miſcellaneous Phænomena, namely, Eclipſes of the Sun and Moon, and Occultations of Planets or fixed Stars not leſs than the fourth Magnitude, by the Moon, as they ſhould happen at Greenwich by the Tables; the Conjunctions of the Moon with all Stars not leſs than the fourth Magnitude, which can be Occultations any where on the Globe, between the Latitudes of 60°. North and 40°. South: The Conjunctions, Oppoſitions and Quadratures of the ſuperior Planets with the Sun; and the Conjunctions and greateſt Elongations of the inferior Planets from the Sun, the Entrance of the Sun into the ſeveral Signs, and any other remarkable Phænomena.

The Stars are expreſſed by Bayer's Characters of Reference. The Conjunction of the Moon or a Planet with a Star, is denoted by prefixing the Character of the Moon or Planet to that of the Star, the Time of the Conjunction being placed immediately after. The Caſe is the ſame with Reſpect to the Occultation of a Star or Planet by the Moon, only this is further diſtinguiſhed by the Addition of Im. or Immerſion, to ſignify the Diſappearance behind the Moon; and Em. or Emerſion, to ſignify the Re-appearance of the ſame. Thus 8ᵈ ☽ ♂ ♍ 16ʰ. 22′. ſignifies that the Moon will be in Conjunction with the Star ♂ ♍ on the Eighth Day at 16ʰ. 22′. excluſive of Parallax: And 10ᵈ. ☽ ☌ ♊ Imm. 9ʰ 14′. Em. 10ʰ. 23′ ſignifies that the Moon will eclipſe ☌ ♊ on the 10th Day, the Immerſion being at 9ʰ 14′. and at 10ʰ. 23′. apparent Time at Greenwich.

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The Occultations ſet down are thoſe only viſible at Greenwich; and the Circumſtances will not differ very widely in moſt Parts of the Kingdom; but in very diſtant Places they will differ very much, owing to the Change of the Moon's Parallax, or it may become no Occultation at all: The like may be ſaid of Eclipſes of the Sun.

Eclipſes of the Sun, and Occultations of fixed Stars by the Moon, if obſerved in Places whoſe Latitude and Longitude are well determined, may be applied to the Correction of the lunar Tables; but if made in Places whoſe Latitude only is well known, may be applied to the Determination of the Longitude of the Place; but for this Purpoſe an accurate Calculation muſt be made of the Moon's Parallaxes in Longitude and Latitude, which makes this Method of ſettling the Longitudes of Places, though a very accurate one, leſs convenient in Uſe for Perſons not much verſed in aſtronomical Calculations. However, this ought not to diſcourage Travellers or Mariners from endeavouring to make theſe Obſervations as often and as carefully as poſſible, when they ſhall happen to be at any Place whoſe Longitude they have Reaſon to think has not been at all or but indifferently determined; ſince the neceſſary Calculations may be made at any Time afterwards by themſelves, at leiſure, or referred to the Skill of Aſtronomers and Mathematicians.

Eclipſes of the Moon are not liable to this Inconvenience; the Longitude of any Place, where an Eclipſe has been obſerved, being deduced immediately by taking the Difference of the Time of the Obſervation and that ſet down in the Ephemeris, and converting it into Degrees, at the Rate of 15 to One Hour, &c. or more briefly by Table Pages 6. 7, 8. of the Tables requiſite to be uſed with the Ephemeris. But as the Beginning or Ending of an Eclipſe of the Moon cannot be generally obſerved nearer than One Minute, and ſometimes Two or Three Minutes of Time, the Longitudes of Places cannot be certainly determined by this Method from a ſingle Obſervation of the Beginning or End nearer than a Degree. It is unneceſſary to mention that even this Point of Exactneſs will often be of great Service. If both the Beginning and End of the Eclipſe be obſerved, a conſiderably greater Degree of Exactneſs will be attained.

The Conjunctions of the Moon with the Planets, or fixed Stars not leſs than the fourth Magnitude, which may prove Occultations in ſome inhabited Parts of the Globe, are evidently deſigned to inſtruct Mariners or Travellers to look out



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frequently for such Observations; which if they happen to prove Occultations, and are carefully observed, will afford a certain Means of determining the Longitude of the Place of Observation.

The Days of the Oppositions, Quadratures, &c. of the Planets with Respect to the Sun, are Times at which they ought to be observed in fixed Observatories, for settling the Elements of their Orbits by a Series of several Years Observations.

The Two first Columns of the Second Page of the Month contain the Day of the Month and Week as before; next follow the Sun's Longitude, right Ascension in Time, Declination, and the Equation of Time, with the Difference from Day to Day.

The Longitude of the Sun is made use of in most of the succeeding Calculations of the Ephemeris, and may serve either to verify them, or to make other similar Calculations at a different Time of the Day. Particularly it may serve with the Help of the Moon's Longitude, to find the Distance of the Moon from the Sun at any Time, independent of the Distances contained in the Four last Pages of the Month. To find the Sun's Longitude at any Time different from Noon, Proportion must be made according to its daily Increase: Saying as $24^h$. is to the Hour from Noon reckoned by the Meridian of Greenwich, so is the daily Variation of the Sun's Longitude, to a fourth Number; which added to the Sun's Longitude at the preceding Noon, gives the true Longitude at the given Time.

If the Time given be that of a Meridian different from Greenwich, it must be first reduced thereto, by adding or subtracting the Difference of Longitude turned into Time (at the Rate of One Hour to 15°, and One Minute of Time to 15 Minutes, or more briefly by Pages 6, 7, and 8, of the requisite Tables) according as the Place is to the West or to the East of Greenwich. Example: Suppose any one should want to know the Sun's Longitude, January 19, 1767, at $4^h$. $35'$. being in 21° $15'$. Longitude East of Greenwich. The Difference of Longitude turned into Time by Table Page 6, is $1^h$. $25'$ which subtracted from $4^h$. $35'$. because the Place is East of Greenwich, leaves $3^h$. $10'$. for the Time reduced to the Meridian of Greenwich. The Sun's Longitude the preceding Noon is, $9^s$. 29°. $18'$. $2''$. and the following Noon is, $10^s$. 0°. $19'$. $4''$. the Difference is, 1°. $1'$. $2''$. or $61'.2''$. the daily Variation. Then say, as $24^h$. is to $3^h$. $10'$. so is $61'.2''$ to $8'.3''$. which added to $9^s$. 29°. $18'.2''$. the Sun's Longitude on the

preceding

preceding Noon, gives 9ᵈ. 29ʰ. 26′. 5″ the Sun's Longitude at the Time given. In like Manner any other of the following Articles is to be found by the Help of the Ephemeris.

The Sun's Longitude ſerves alſo to compute the Aberration of the fixed Stars and Planets.

The Sun's right Aſcenſion in Time is uſeful to the practical Aſtronomer in regular Obſervatories, who adjuſts his Clocks by ſidereal Time. It is alſo uſeful to him for converting apparent into ſidereal Time; as ſuppoſe that of an Eclipſe of Jupiter's Satellites, in order to know at what Time it may be expected to happen by his Clocks: For this Purpoſe, the Sun's right Aſcenſion at the preceding Noon, together with the Increaſe of right Aſcenſion from Noon, muſt be added to the apparent Time of the Phænomenon ſet down in the Ephemeris.

The Sun's right Aſcenſion in Time ſerves alſo to compute the apparent Time of a known Star's paſſing the Meridian: Thus ſubſtract the Sun's right Aſcenſion in Time at Noon from the Star's right Aſcenſion in Time, the Remainder is the apparent Time of the Star's paſſing the Meridian nearly; from which the proportional Part of the daily Increaſe of the Sun's right Aſcenſion for this apparent Time from Noon being ſubſtracted, leaves the correct Time of the Star's paſſing the Meridian.

Hence the apparent Time may be found from an obſerved Altitude of a known fixed Star, ſuppoſe one contained Page 12 or 13 of the requiſite Tables; as will be explained hereafter.

The Sun's right Aſcenſion in Time is alſo uſeful for computing the Time of the Moon and Planets paſſing the Meridian, as will be ſhewn under their proper Articles.

The Sun's Declination is neceſſary to find the Latitude, whether at Sea or Land, from the Meridian Altitude obſerved; it is alſo requiſite for finding the Latitude from Two Altitudes obſerved with the Interval of Time meaſured by a Watch; it ſerves for computing the Sun's Azimuth, having his Altitude and the Latitude of the Place given, in order to find the Variation of the Compaſs; it is required jointly with the Latitude of the Place and the Sun's horary Angle to compute his Altitude, if neglected to be obſerved at the Time of taking the Moon's Diſtance from the Sun for finding the Longitude, being uſeful to facilitate the Calculation of the Effect of Refraction and Parallax upon the Diſtance; it is alſo neceſſary to calculate the apparent Time from an obſerved Altitude of the Sun at a Diſtance

from

from the Meridian, the Latitude being given; or to compute the Time of the Sun's Setting or Riſing; which, though a leſs accurate Method than the former of obtaining the Time, may yet be uſeful when that cannot be had. For any of theſe Purpoſes, the Sun's Declination muſt be found to the Time given nearly reduced to the Meridian of Greenwich, making Proportion according to the daily Increaſe or Decreaſe, in like Manner as was ſhewn with Reſpect to the Sun's Longitude.

The Equation of Time is a Correction, which added to or ſubſtracted from the apparent Time (according to its Title at the Top of the Column) gives equated or mean Time, or that which ſhould be ſhewn by a good Clock or Watch. Apparent Time is that which takes its Beginning from the Paſſage of the Sun's Centre over the Meridian of any Place; and had the Sun no Motion in the Ecliptic, or was his Motion reduced to the Equator or in right Aſcenſion uniform, he would always return to the Meridian after equal Intervals of Time. But his apparent Motion in the Ecliptic being continually varying, and his Motion in right Aſcenſion being rendered further unequal on Account of the Obliquity of the Ecliptic to the Equator, from theſe Cauſes it ariſes that the Intervals of his Return to the Meridian become unequal, and the Sun will gradually come too ſlow or too ſoon to the Meridian for an equable Motion, ſuch as that of Clocks and Watches ought to be.

This Retardation or Acceleration of the Sun's coming to the Meridian is called the Equation of Time, and is contained in the laſt Column but One of Page 2d; and when applied according to its Title to the Apparent Time, or that deduced immediately from the Sun, gives the mean or equated Time, whence the Error of a Clock or Watch may be found, and, if required, it may be corrected.

If it is propoſed to convert mean Time into apparent, this is done by a contrary Proceſs, by applying the Equation of Time to the mean Time given, with its Title or Sign changed; *viz.* ſubſtracting inſtead of adding, and adding inſtead of ſubſtracting.

The Equation of Time being ſet down in the Ephemeris for the Noon at Greenwich, Proportion muſt be made according to the daily Difference, to find what it ſhould be at any given Time reduced to the ſame Meridian, as in the preceding Articles. The laſt Column of this Page, containing the daily Differences of the Equation, is deſigned for this Purpoſe,

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As often at it may be required to make any Calculations from aſtronomical Tables, and the Time given be apparent Time; it is neceſſary firſt to apply the Equation of Time thereto to convert it into mean Time, the Tables being diſpoſed according to mean Motions. Thus the Articles contained in the Ephemeris anſwering to Noon were computed to $0^h$. increaſed, or 24 Hours diminiſhed, by the Equation of Time: And the Moon's Places ſet down for Midnight were computed to $12^h$. increaſed or diminiſhed by the Equation of Time.

What has been ſhewn concerning the Equation of Time chiefly reſpects the Aſtronomer, the Mariner having little to do with it in computing his Longitude from the Moon's Diſtances from the Sun and Stars obſerved at Sea with the Help of the Ephemeris, all the Calculations thereof being adapted to apparent Time, the ſame which he will obtain by the Altitudes of the Sun or Stars in the Manner hereafter preſcribed.

But if Watches made upon Mr. John Harriſon's or other equivalent Principles ſhould be brought into Uſe at Sea, the apparent Time deduced from an Altitude of the Sun muſt be corrected by the Equation of Time, and the mean Time found compared with that ſhewn by the Watch, the Difference will be the Longitude in Time from the Meridian by which the Watch was ſet; as near as the Going of the Watch can be depended upon.

The Equation of Time was computed for the Ephemeris of 1767 from the Table, Page 3d of Mayer's Tables; but on Account of that Table being made only to the neareſt Second without Decimals, and the Neglect of the ſmall Equations of the Sun, the Calculations of that Article in the Year 1767, cannot always be depended upon nearer than Two Seconds. For the Year 1768 and the following Years it will be computed in the ſtrict Manner explained in my Remarks upon that Subject, in the Philoſ. Tranſact. Vol. liv. P. 342 for the Year 1764; namely, by taking the Difference of the Sun's true right Aſcenſion, and his mean Longitude corrected by the Equation of the Equinoxes in right Aſcenſion, and turning it into Time at the Rate of 1′. to 15′. &c. The Equation of Time will be additive or ſubſtractive as the Sun's true right Aſcenſion is greater or leſs than his mean Longitude.

The Semidiameter of the Sun, Page 3d, is neceſſary to reduce the obſerved Altitude of his upper or lower Limb to that of

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of the Centre; alſo to reduce the obſerved Diſtance of the Moon's neareſt Limb from the Sun's neareſt Limb to the Diſtance of the Centres. It is alſo uſeful to Aſtronomers to verify or aſcertain the Exactneſs of the Scale of their Micrometers, by Compariſon with the Meaſure of the Sun's horizontal Diameter. This Practice is particularly uſeful in ſolar Eclipſes, when the Diſtance of the Cuſps, or the Verſe Sine of the uneclipſed Part has been meaſured with the Micrometer. The Semidiameters of the Sun in Mayer's Tables, on which all the Calculations reſpecting the Sun and Moon are made, ſuppoſe the Semidiameter at the mean Diſtance to be 16'. 2", 8. which Mr. Mayer ſays he deduced from above 130 Obſervations taken with his Six Foot mural Quadrant, which ſeemed to him not ill adapted to the Purpoſe. It may not be amiſs to take this Opportunity to remark that the Quadrant here mentioned was given to the Univerſity of Gottingen by his late Majeſty, and was made by Mr. John Bird after the Model of the Eight Foot mural Arch, which he finiſhed for the Royal Obſervatory at Greenwich, and put up there in the Year 1750. Mr. Mayer made his Obſervations with his Six Foot mural Arch, from the Year 1756, to the Time of his Deceaſe; with it he ſettled the mean Obliquity of the Ecliptic to the Beginning of the Year 1756, at 23°. 28'. 16". which Dr. Bradley ſettled by his Obſervations made in the Years 1750 and 1751, at 23°. 28'. 18". The Difference is agreeable to what ought to ariſe from the gradual Diminution of the Obliquity of the Ecliptic at the Rate of about ½ a Second in a Year. The ſame Inſtrument he alſo uſed in ſettling the Elements of his ſolar Tables; and it is moſt probable that with the ſame he ſettled his Table of Refractions at the End of his ſolar Tables; the Agreement of this Table with Dr. Bradley's, ſee Page 2d of requiſite Tables, (being both ſuited to the ſame Temperature of the Air) is ſo great, that they ſeem rather like One and the ſame than Two different Tables.

The Time of the Sun's Semidiameter paſſing the Meridian, ſerves to reduce an Obſervation of a Tranſit of the preceding or ſubſequent Limb over the Meridian to that of the Centre, when only One was obſerved. It ſignifies a Portion of apparent Time, or even mean Time, the Difference being abſolutely inſenſible upon ſo ſmall an Interval. It is found thus: Increaſe the Sun's Semidiameter in the Ratio of the Coſine of his Declination to the Radius, to find his Semidiameter in right Aſcenſion, which turned into Time at the Rate of 1'. to 15'. and 1". to 15". gives the

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Time required. The Sun's Semidiameter in right Aſcenſion is readily found by adding the Log. Coſine of his Declination to the logiſtic Logarithm of his Semidiameter, the Sum is the logiſtic Logarithm of his Semidiameter in right Aſcenſion; which divided by 15 gives the Time of his Semidiameter paſſing the Meridian. If the Clock by which the Obſervation is made be regulated according to ſidereal Time, this Quantity muſt be increaſed in the Ratio of 365 to 366, if great Preciſion is required.

From the Time of the Sun's Semidiameter paſſing the Meridian may be alſo found the Time of its paſſing the horizontal or vertical Wire of a Quadrant or Sextant, which on ſome Occaſions may have its Uſe.—The hourly Motion of the Sun is uſeful in computing ſolar and lunar Eclipſes; alſo in correcting the aſſumed Longitude of the Ship, in order to find the Time from an Obſervation of the Diſtance of the Moon from the Sun, independant of the Diſtances contained in the nautical Ephemeris; See Britiſh Mariner's Guide, Page 49, and Table at the End of the ſame, Page 25, which is alſo copied at Page 14 of requiſite Tables. The Logarithm of the Sun's Diſtance is uſeful in the Calculation of the Places of the Planets and Comets. The Place of the Moon's Node ſignifies its mean Longitude, and is neceſſary for finding the Equation of the equinoctial Points both in Longitude and right Aſcenſion, the Equation of the Obliquity of the Ecliptic, and the Deviations of the fixed Stars in right Aſcenſion and Declination.

The Eclipſes of Jupiter's Satellites are well known to afford the readieſt, and for general Practice the beſt Method of ſettling the Longitudes of Places at Land; and it is by their Means principally that Geography has been ſo much reformed within a Century paſt, and the Poſition of the moſt diſtant Places determined to equal Accuracy with the neareſt. It was hoped that ſome Means might be found of uſing proper Teleſcopes on Shipboard to obſerve theſe Eclipſes, and could this be effected, it would be of great Service in aſcertaining the Longitude of a Ship from Time to Time. In my Voyage to Barbadoes under the Direction of the Commiſſioners of Longitude, I made a full Trial of the late Mr. Irwin's Marine Chair propoſed for this Purpoſe, but found it totally impracticable to derive any Advantage from the Uſe of it; and, conſidering the great Power requiſite in a Teleſcope for making theſe Obſervations well, and the Violence as well as



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Irregularities of the Motion of a Ship, I am afraid the complete Management of a Teleſcope on Shipboard will always remain among the Deſiderata. However, I would not be underſtood to mean to diſcourage any Attempt founded upon good Principles to get over this Difficulty.

The Teleſcopes proper for obſerving the Eclipſes of Jupiter's Satellites, are common refracting Teleſcopes, from 15 to 20 Feet, reflecting Teleſcopes of 18 Inches or Two Feet, and Teleſcopes of Mr. Dollond's Conſtruction with Two Object Glaſſes from Five to 10 Feet; or, which are ſtill more convenient, thoſe of $3\frac{1}{2}$ Feet, which he has lately found a Method of conſtructing with Three Object Glaſſes, which are as manageable as reflecting Teleſcopes, and perform as much as thoſe which he makes of 10 Feet with Two Object Glaſſes.

The Eclipſes of Jupiter's Satellites are obſerved by Aſtronomers at Land, as well in order to provide Materials for improving the Theories and Tables of their Motions, as for the ſake of Compariſon with the correſponding Obſervations which may be made by Perſons in different Parts of the Globe, whereby the Longitude of ſuch Places will be accurately aſcertained. It is indeed to be lamented that Perſons who viſit diſtant Countries are not more diligent to multiply Obſervations of this Kind, for want of which, the Obſervations made by Aſtronomers on Shore loſe Half their Uſe, and the Improvement of Geography ſeems to be at a Stand. But it is to be hoped that an Emulation will ſpring up among thoſe who may have Opportunities of rendering ſo uſeful a Service to the Public, to incite them to watch diligently for the Occaſions of obſerving theſe Eclipſes carefully, particularly of the Firſt and Second, which are moſt exact for the Purpoſe. The Eclipſes carefully calculated and ſet down in the Ephemeris, will ſerve to advertiſe them and Obſervers in general of the Times when they ſhould attend to theſe Obſervations. The Perſon who ſhall be under any Meridian different from Greenwich, muſt turn his Difference of Longitude into Time: See Table Page 6, 7, and 8, and add it to or ſubſtract it from the Time of the Eclipſe ſet down in the Ephemeris, according as he is to the Eaſt or Weſt of Greenwich, to find the apparent Time at which the Eclipſe will happen at his Meridian, nearly. He muſt further take care to regulate his Watch or Clock by apparent Time, or at leaſt to know the Difference, as well in order to appriſe him of the Time to look out for

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the Eclipſe, as for aſcertaining the apparent Time exactly at which he ſhall obſerve it. Equal Altitudes of the Sun or Stars taken with an aſtronomical Quadrant afford the beſt Means of regulating Clocks and Watches for occaſional Obſervations; or they may be taken with a Hadley's Quadrant, by Reflection from a Baſon of Water or Quickſilver, or from the Horizon of the Sea, if the Obſerver has an open Proſpect, and is not elevated above 5 or 600 Feet above the Level of the Sea. But, if Opportunity does not admit of taking equal Altitudes, the Time may be determined from One Altitude taken in any of the Methods above mentioned, at leaſt Two or Three Points of the Compaſs diſtant from the Meridian, but the nearer to the Eaſt or Weſt the better, the Latitude of the Place being known, or being found by Obſervations of the Meridian Altitude of the Sun or Stars made on Purpoſe. It will be better to take ſeveral Altitudes in order to take a Mean of the Reſults for greater Certainty. The Manner of computing the apparent Time from the Altitude of the Sun or a Star, will be obſerved when we come to treat of the Method of finding the Longitude by the Obſervations of the Diſtance of the Moon from the Sun and Stars by the Help of the Ephemeris.

The Obſerver being in a Place whoſe Longitude is well known, ſhould be ſettled at his Teleſcope Three Minutes before the expected Time of an Immerſion of the firſt Satellite; Six or Eight Minutes before that of the ſecond and third Satellites; and a Quarter of an Hour or more before that of the fourth Satellite; chiefly on Account of the Uncertainty of their Theories; but, if the Longitude of the Place is very uncertain, he muſt begin to look out for the Eclipſe proportionably ſooner: Thus if the Longitude of the Place is uncertain to 30 Degrees, anſwering to 12 Minutes of Time, he ought to fix himſelf to his Teleſcope 12 Minutes ſooner than is mentioned above. Nevertheleſs when he has obſerved One Eclipſe of any Satellite, and thereby found the Error of the Tables, he may allow the ſame Correction to the Calculations of the Ephemeris for ſeveral Months, which will adverſe him very nearly of the Time of expecting the Eclipſes of the ſame Satellite, and diſpenſe with his attending ſo long.

The Immerſions ſignify the Inſtant of the Diſappearance of the Satellite by entering into the Shadow of Jupiter; and the Emerſions ſignify the firſt Inſtant of its Appearance at coming

ing out of the ſame. They generally happen when the Satellite is at ſome Diſtance from the Body of Jupiter, except near the Oppoſition of Jupiter to the Sun, when the Satellite approaches nearer to his Body. Before the Oppoſition of Jupiter to the Sun the Immerſions and Emerſions happen on the Weſt Side of Jupiter, and after the Oppoſition on the Eaſt Side; but if an aſtronomical Teleſcope be uſed, which reverſes Objects, the Appearances will be directly the contrary. Before the Oppoſition, the Immerſions only of the firſt Satellite are viſible; and after the Oppoſition, the Emerſions only. The ſame is generally the Caſe with reſpect to the ſecond Satellite; both the Phænomena of the ſame Eclipſe are frequently obſerveable in the Two outer Satellites. The Immerſions and Emerſions marked with an Aſteriſk in the Ephemeris are thoſe viſible at Greenwich.

To know if an Eclipſe will be viſible in any Place, find if Jupiter is 8°, or 10°. above the Horizon of the Place, and the Sun as much below it. This may be done near enough by a celeſtial Globe: Otherwiſe, the Time of the Sun's Riſing and Setting may be found for any Latitude by a Table of ſemidiurnal Arcs, contained in the popular Book called the Mariner's Compaſs Rectified, and many other Books; the Time of Jupiter's Riſing and Setting may alſo be found from the Time of his paſſing the Meridian and Declination ſet down in the Ephemeris, with the Help of the ſame Table of ſemidiurnal Arcs; adding or ſubſtracting the ſemidiurnal Arc anſwering to the ſame Declination of the Sun: Remembering always that if Jupiter's Declination and the Latitude of the Place are of the ſame Denomination, the ſemidiurnal Arc will be more than Six Hours, and if they are of contrary Denominations, it will be leſs than Six Hours.

The Immerſion or Emerſion of any Satellite being carefully obſerved in any Place according to apparent Time, the Longitude from Greenwich is found immediately by taking the Difference of the Obſervation from the correſponding Time ſhewn in the Ephemeris, which muſt be turned into Degrees, &c. by Table Page 6, 7, and 8; and will be Eaſt or Weſt of Greenwich, as the Time obſerved is more or leſs than that of the Ephemeris.

Example: Suppoſe an Emerſion of the firſt Satellite ſhould be obſerved at the Cape of Good-Hope, May 9, 1767, at $10^h. 46'. 45''.$ apparent Time: The Time by the Ephemeris being

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being 9h. 33′. 12″. the Difference is 1h. 13′. 33″. whence by Table Page, 6, 7, and 8, the Longitude of the Cape ſhould be 18°. 23′ 15″. Eaſt of Greenwich, becauſe the Time ſuppoſed to be obſerved at the Cape is more than that of the Ephemeris.

It may not be uſeleſs here to obſerve that the Longitude of the Cape of Good Hope 1h. 13′. 33″=18°. 23′. 15″. ſet down in the Britiſh Mariner's Guide, is that of the Town; the Latitude alſo belongs to the ſame; being both determined from the Obſervations of Meſſrs. Maſon and Dixon, who went thither under the Direction of the Royal Society, and obſerved the Tranſit of Venus in the Year 1761. Hence, by the Help of the Charts, I find the Longitude of the Cape Point or Promontory 18°. 45′. Eaſt of Greenwich, and its Latitude 34°. 30′. S. the Longitude of Cape Falſo, 19°. 15′. E. and its Latitude 34°. 34′ S. If theſe Determinations of the Situations of the Cape Point and Cape Falſo are in any reſpect uncertain, it ariſes from the Imperfection of the Charts I was obliged to make uſe of, in reducing the Longitude and Latitude from the Cape Town to the Two mentioned Points: For from the near Agreement of the Abbeé de la Caille's Obſervations with thoſe of Meſſrs. Maſon and Dixon, it is probable that the Situation of few Places is better determined than that of the Cape Town: But if any one has Poſſeſſion of any Manuſcript or printed Charts of theſe Parts that he thinks may be depended upon, or has any Opportunity of determining the Points in Queſtion relatively to each other from the Compariſon of ſeveral Journals of Ships, he may perhaps fix theſe Places with more Certainty than is here pretended to.

It is to be obſerved that a correſpondent Obſervation of an Eclipſe of a Satellite of Jupiter, made under a well known Meridian, is to be preferred to the Calculations of the Ephemeris for comparing with an Obſervation made in a Meridian whoſe Longitude is required; but if no correſponding Obſervation can be obtained, as is frequently the Caſe, it will be beſt to find what Correction the Calculations of the Ephemeris require by the neareſt Obſervations to the given Time that can be obtained; which Correction applied to the Calculation of the given Eclipſe in the Ephemeris, renders it almoſt equivalent to an actual Obſervation.

The Longitudes and Latitudes of the Planets, Page 4. ſerve to know where to look for them in the Heavens, and

when

when their Places may be conveniently ſettled by comparing them with fixed Stars by the Help of a Micrometer in a Teleſcope. They alſo ſhew when they are in the moſt important Points of their Orbits, where it is moſt material to obſerve them. They alſo ſerve to enable Perſons leſs ſkilled to diſtinguiſh them from the fixed Stars. Their Declinations and apparent Time of paſſing the Meridian are particulary uſeful to Aſtronomers who are furniſhed with Quadrants and Tranſit Inſtruments well fixed in the Meridian, in ſetting their Inſtruments for obſerving their right Aſcenſions and Declinations.

The apparent Time of a Planet's paſſing the Meridian may be computed thus; the Planet's right Aſcenſion being calculated from its Longitude and Latitude, and turned into Time, ſubſtract the Sun's right Aſcenſion at Noon in Time from it, to find the Time of the Planet's paſſing the Meridian nearly, which call T; take the Difference of the ☉ and Planets daily Variations in right Aſcenſion in Time; if the Planet is progreſſive in right Aſcenſion, or the Sum if it is retrograde, which call X; then ſay, by the Rule of Proportion;

As $24^h \mp X : T :: X : e$ and $T \pm$ will be the correct Time of the Planet's paſſing the Meridian. The upper Signs are to be uſed both to X and e if the Planet's progreſſive Motion in right Aſcenſion be greater than that of the Sun; in any other Caſe the lower Signs are to be made uſe of.

But perhaps it may be found more readily by continual Approximation as follows: Take the proportional Part of the Difference or Sum of the ☉ and Planet's daily Motion in right Aſcenſion, anſwering to the Time of the Planet's paſſing the Meridian, found nearly, in Proportion to $24^h$. and take a further like proportional Part of this proportional Part; and again of this laſt, and ſo on as far as is neceſſary. The Sum of all theſe proportional Parts added to the Time of the Planet's paſſing the Meridian found nearly, if the Planet's progreſſive Motion in right Aſcenſion is greater than that of the Sun, otherwiſe ſubſtracted, gives the apparent Time of the Planet's paſſing the Meridian.

Example: Let it be required to find the Time of the Moon's paſſing the Meridian, July 1 1767.

The Sun's right Aſcenſion in Time July 1ſt is, $6^h. 40'. 25''$. and July 2d, $6^h. 44'. 33''$. by the Ephemeris. Therefore his daily Motion in right Aſcenſion is $4'. 8''$. The Moon's right Aſcenſion July 1ſt at Noon by the Ephemeris, is $159°. 2'.$ anſwering to $10^h. 36'. 8''.$ of Time, and July 2d is, $169°. 39'.$ anſwering

fwering to 10h. 18′. 36″. The Difference is, 42′. 28″. of Time, from which 4′. 8″. being ſubſtracted leaves 38′. 20″. Subſtract 6h. 40′ 25″. the Sun's right Aſcenſion July 1ſt, at Noon from 10h. 36′. 8″, the Moon's right Aſcenſion the ſame Noon, the Remainder 3h. 55′. 43″. is the Approximate Time of the Moon's paſſing the Meridian. The proportional Part of 38′. 20″ anſwering to this, is 6′. 17″ and the proportional Part of 6′. 17″. is 9″; therefore 6′. 17″ and 9″ or 6′. 26″ added to 3h. 55′. 43″ give 4h. 2′. 9″, the apparent Time of the Moon's paſſing the Meridian. In the Ephemeris it is 4h. 2′. It may alſo be computed by taking the Difference of the Moon's right Aſcenſions at Noon and Midnight, but then half the Sun's daily Variation in right Aſcenſion muſt be made uſe of, and Proportion muſt be made for 12 inſtead of 24 Hours: And if the Moon paſſed the Meridian after Midnight, the Sun's right Aſcenſion at Midnight muſt be uſed, which is a Mean between his right Aſcenſions on the preceding and ſubſequent Noon. For the Planet's, it will be ſufficient to take the firſt proportional Part only.

The Configurations of Jupiter's Satellites, Page 5, exhibit the apparent Poſitions of the Satellites with reſpect to each other, and to Jupiter at ſuch an Hour of the Evening or Night as they are moſt likely to be obſerved, and ſerve to diſtinguiſh the Satellites from one another. Jupiter is diſtinguiſhed by the Mark ⊙, and the Satellites by Points with Figures annexed, the Figure 1 ſignifying the firſt Satellite, 2 the ſecond Satellite, &c. When the Satellite is approaching towards Jupiter, the Figure is put between Jupiter and the Point; and when the Satellite is receding from Jupiter, the Figure is put on the other Side of the Point. The Satellites are in the ſuperior Parts of their Orbits, or furtheſt from the Earth, when they are marked to the right Hand or Weſt of Jupiter approaching him; or to the left Hand or Eaſt of Jupiter receding from him; but are in the inferior Part of their Orbits, or neareſt to the Earth, when they are marked to the right Hand or Weſt of Jupiter receding from him, or to the left or Eaſt of Jupiter approaching him. The Cypher o ſometimes annexed to the Figure of the Satellite towards the Margin, ſignifies that it is inviſible on the Face of Jupiter; and the black Mark ●, ſignifies that it is inviſible, being eclipſed in Jupiter's Shadow, or behind Jupiter, and eclipſed by his Body.

The 7th and 5 following Pages of each Month contain the Moon's Place, and all the Circumſtances relating to her Mo-

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tions, and her Distances from the Sun and proper Stars, from which her Distance should be observed for finding the Longitude at Sea. The Longitudes, Latitudes, and Declinations of the Moon, and Time of her passing the Meridian, afford the like Uses with the same Circumstances of the Planetary Motions, and many more besides. For the sake of greater Precision, the Moon's Longitude, Latitude, Right Ascension, Declination, Semidiameter, horizontal Parallax, with its logistic or proportional Logarithm, are computed twice a Day, to Noon and Midnight, and may readily be inferred to any intermediate Time with the greatest Exactness.

Example. Let it be required to find the Moon's Longitude and Latitude, &c. July 16, 1767, at $16^h. 22'. 16''$. First to find the Longitude. The Moon's Longitude, July 16, at $12^h.$ is $10^s. 6^\circ. 40'. 25''$, and July 17 at Noon, $0^s. 13^\circ. 47'. 48''$. the Difference $7^\circ. 7'. 23''$. is the Moon's Motion in 12 Hours; say then, by the Rule of Proportion,

As $12^h.$ is to $4^h. 22'. 16''$. (the Excess of $16^h. 22'. 16''$. above $12^h.$) so is $7^\circ. 7'. 23''$. to $2^\circ. 35'. 41''$. which added to $0^s. 6^\circ. 40'. 25''$. the Moon's Longitude at $12^h.$ gives $0^s. 9^\circ. 16'. 6''$. the Moon's Longitude nearly; but this must be corrected on Account of the Moon's unequal Motion in 12 Hours, by Page 11 of requisite Tables; for this Purpose take out of the Ephemeris the Two Longitudes of the Moon next preceding the given Time, and the Longitudes immediately following it, and set them down in Order one after another, as follows.

| | | 1st Diff. | 2d. Diff. |
|---|---|---|---|
| | ° ′ ″ | ° ′ ″ | |
| July 16, Noon | 11. 29. 29. 34 | | |
| | | 7. 10. 51. | |
| Midnight | 0. 6. 40. 58. | | 3. 28. |
| | | 7. 7. 23. | |
| 17, Noon | 0. 13. 47. 24. | | 3. 44. |
| | | 7. 3. 39. | |
| Midnight | 0. 20. 51. 27. | | |

Take their Differences, $7^\circ. 10'. 51''$. $7^\circ. 7'. 23''$. $7^\circ. 3'. 39''$. take the Differences of these Differences, or the 2d Differences, $3'. 28''$. $3'. 44''$. and take their Mean which is $3'. 36''$. Now look for the Correction in Page 11 of requisite Tables answering to $4^h. 22'$ after Midnight, found on the Side, and $3' 36''$ at Top, $21''$ will be found under $3'$. and $28''$. under $4'$. the the Difference is $7''$. whence $36''$ will require $4'$, and the Correction sought is $21'' + 4' = 25''$. which, according to the Remark at the Bottom of the Table, must be added (because

cauſe the Motion in 12 Hours or firſt Differences are decreaſing to 0ˢ. 9°. 16′. 6″. the Moon's Longitude found by even Proportion; whence the Moon's true Longitude is 0ˢ. 9°. 16′. 31″. and is as correct as the Longitudes from which it is deduced.

N. B. If the firſt Differences of the Four Longitudes of the Moon taken out firſt increaſe and then decreaſe, or, vice verſâ, firſt decreaſe and then increaſe, take half the Difference of the Two ſecond Differences for the Mean ſecond Difference, with which take the Correction from Page 11, and add or ſubſtract it as the 1ſt. firſt Difference is greater or leſs than the third firſt Difference.

To find the Moon's Latitude. Take out of the Ephemeris the Two Latitudes preceding and Two following the given Time, and ſet them down in Order, and take their firſt and ſecond Differences, and the mean of the Two ſecond Differences; find the proportional Part of the Middle firſt Difference anſwering to the Hours and Minutes, &c. of the given Time after Noon or Midnight; which correct in the following Manner: Entering Table Page 11 with the Hour from Noon or Midnight on the Side, and the mean ſecond Difference at Top, take out the correſponding Number of Seconds, which added to or ſubſtracted from the proportional Part found above, according as the Motion in 12 Hours or firſt Differences are decreaſing or increaſing; or, more generally, according as 1ſt firſt Difference is greater or leſs than third firſt Difference, gives the proportional Part corrected; which now added to or ſubſtracted from the Moon's Latitude at the preceding Noon or Midnight, as the Latitude in theſe 12 Hours is increaſing or decreaſing, gives the Moon's Latitude correct.

Example: The Moon's Latitude is required, July 16, 16ʰ. 22′. 16″.

| | ☽'s Lat. by the Ephem. | 1ſt Dif. | 2d Dif. | Mean of 2d Dif. |
|---|---|---|---|---|
| | °. ′. ″. | ′. ″. | ′. ″. | |
| July 16, Noon | 4 31 10 N. | | | |
| | | 18 26 | 4 36 | ′. ″. |
| Midnight | 4 49 36 | | | 4 49 |
| | | 13 50 | 4 44 | |
| 17 Noon | 5 3 26 | | | |
| | | 9 6 | | |
| Midnight | 5 12 32 | | | |



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The Moon's Latitude July 16 at Midnight being 4°. 49′. 36″. N. and the Motion in the next 12 Hours being 13′. 50″. ſay by Proportion;

As 12ʰ. is to 4ʰ. 22′. 16″. ſo is 13′. 50″. to 5′. 2″; but this muſt be corrected by adding 33″. the Correction from Page 11, anſwering to the Hour 4ʰ. 22′. and the Mean Second Difference 4′ 40″, becauſe the firſt Differences are decreaſing, or rather becauſe the firſt of them 18′. 26″. is greater than the laſt of them 9′. 6″. therefore the proportional Part corrected is 5′. 2″.+33″=5′. 35″, which added to 4°. 49′. 36″. gives 4°. 55′ 11″. N. the Moon's Latitude correct.

Remarks on ſome Circumſtances neceſſary to be attended to, in order to obtain and apply the Correction of ſecond Differences rightly in computing the Moon's Latitude.

I. If the Moon's Latitude taken out of the Ephemeris for Noon and Midnight changes its Denomination from North to South or from South to North, the Sum of the Two Latitudes of contrary Denominations, where the Change happens, is to be accounted the firſt Difference in that Place.

II. If the Three firſt Differences firſt increaſe and then decreaſe, or vice verſa, firſt decreaſe and then increaſe, Half the Difference of the Two ſecond Differences is to be taken for the mean ſecond Difference.

III. If the Series of Four Latitudes taken out ſhould firſt increaſe and then decreaſe about the Moon's greateſt Latitudes, take the Sum of the Two firſt Differences ſtanding on each Side of the greateſt Latitude for the ſecond Difference in that Place; correct the Moon's Latitude at Noon or Midnight by the ſimple proportional Part firſt found; and to the Latitude ſo corrected, add always in this Caſe the Correction from Table Page 11, anſwering to the Mean of the Two ſecond Differences.

Before I quit this Subject of Interpolation by ſecond Differences, I ſhall point out another Method, by which the ſame End may be obtained more readily, and with fewer Rules, by thoſe who are well acquainted with algebraical Subſtraction and Addition, and the Manner of applying the Signs in thoſe Operations. Subtract each Latitude from the following for the firſt Differences, to which prefix the Sign — if the Latitudes decreaſe; and ſubſtract each firſt Difference, thus found, from the following one of the ſame Order for the ſecond Differences. Half the Sum of the Two ſecond Differences

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ferences ſtanding on each Side of the Interval to be interpolated, is to be accounted the mean ſecond Difference; the Correction correſponding to it by Table Page 11, is to be applied always with the contrary Sign.

Theſe Operations are to be performed, and the Signs to be applied as in algebraic Subſtraction and Addition. Note further, if the Four given Latitudes change their Denomination, call the ſecond Latitude +, and thoſe of a contrary Denomination —.

The Moon's Declination may be found at any Hour in the ſame Manner as her Latitude; but as the Correction ariſing from ſecond Differences will never exceed $2\frac{1}{2}'$, this may be neglected on moſt Occaſions: but if any one is deſirous to obtain the Declination true to a Minute, the Correction eaſily applied, as ſhewn above.

The other Articles of Page 7, and 8, *viz.* the Moon's right Aſcenſion, her Semidiameter, horizontal Parallax, with its Logarithm, and the Diſtances contained in the Four laſt Pages of the Month, may be all found correctly by even Proportion, without requiring any Allowance on Account of ſecond Differences. The proportional Part of the Moon's Longitude, *&c.* for any Hour, may be found very readily by the Help of the Table of proportional Logarithms at the End of the requiſite Tables: For which conſult the Explanation of thoſe Tables.

The Moon's Longitude and Latitude are uſed in computing her Diſtances from the Sun and Stars contained in the Four laſt Pages of the Month, as well as in the Appulſes to Stars pointed out in Page 1, and, jointly with her Parallax and Semidiameter, are neceſſary for computing the Eclipſes of the Sun and Moon, and the Occultations of fixed Stars and Planets by the Moon. They alſo facilitate the Calculation of the Longitude of any Place from an Eclipſe of the Sun, or an Occultation of a Star or Planet by the Moon obſerved: Or, if the Meridian be well known, the Parallax and Semidiameter ſerve to deduce the Moon's true Place in the Heavens from the Obſervation, which compared with that given by the Ephemeris ſhews the Error of the Tables, whatever it be at that Time. The Moon's Semidiameter and Parallax are applied in correcting almoſt all Obſervations of the Moon. The logiſtic Logarithms of the Moon's Parallax, ſerve further to facilitate the Calculations of Parallaxes, but if the Table of proportional Logarithms at the End of the requiſite Tables be made uſe,



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of, which will be moſt convenient; the conſtant Quantity 0.4771 muſt be added to the logiſtic Logarithms of the Moon's horizontal Parallax contained in the Ephemeris of 1767, to reduce them to proportional Logarithms. It will be more convenient to ſubſtitute proportional Logarithms of the Moon's Parallax inſtead of the logiſtic Logarithms in a future Ephemeris.

The Moon's right Aſcenſion and Declination are uſeful to compute her Altitude at any Time, particularly at the Obſervation of her Diſtance from the Sun or a Star, ſuppoſing it was neglected to be or could not be obſerved properly; which latter Caſe may ſometimes happen in the Night, though I think but rarely; the utmoſt Accuracy not being required for the Calculations of Refraction and Parallax. See Britiſh Mariner's Guide. Page 57. The Moon's Declination, with her Semidiameter and Parallax, ſerve for finding the Latitude by the Meridian Altitude of her upper or lower Limb obſerved at Sea. See Britiſh Mariner's Guide, Page 93. The Moon's right Aſcenſion and Declination ſerve alſo to compute the Time from her Altitude obſerved at the Obſervation of her Diſtance from a Star; whence the Longitude may be inferred, though no Altitude of the Sun or a Star was taken for regulating the Time. See Britiſh Mariner's Guide, Page 61.

The Diſtances of the Moon from the Sun and fixed Stars, contained in the Four laſt Pages of the Month, are ſet down to every Three Hours of Apparent Time by the Meridian of Greenwich, and are deſigned to relieve the Mariner from the Neceſſity of a Calculation, which he might think prolix and troubleſome, and to enable him, when compared with the ſame Diſtances obſerved carefully at Sea, to infer his Longitude readily and with little Danger of Miſtake to a Degree of Exactneſs that may be thought ſufficient for moſt nautical Purpoſes. But uſeful and valuable as the Practice of this Method may be at preſent, it is a Remark not unworthy our Notice, that there is Room to hope, by future Improvements of the lunar Tables, and the Introduction of a more accurate Method of conſtructing Inſtruments, it may be carried to a much higher Degree of Perfection.

The Moon's Diſtance are computed both from the Sun and proper Stars, and generally from One Object on each Side of her, to afford the Mariner a greater Number of Opportunities of Obſervation, and a Means of attaining a greater Degree of Exactneſs. The Diſtances from the Sun

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are computed between 40° and 120° of Diſtance. While the Moon is between the Diſtances of 20° and 40° from the Sun, her Diſtance is computed only from a Star on the contrary Side that the Sun is. When ſhe is between the Diſtances of 40° and 90° from the Sun, her Diſtance is computed both from the Sun and from a Star on the contrary Side to the Sun; when the Moon is above 90° from the Sun her Diſtance is computed from Two Stars, one on each Side of her; though ſtill her Diſtance is computed alſo from the Sun from 90° to 120°. Though the Diſtance of the Moon from the Sun or Star, well obſerved with a good Inſtrument, is ſufficient to determine the Longitude, with the Help of the Ephemeris, always within a Degree, and generally much nearer, yet it will conduce to ſtill greater Accuracy, if the Obſerver takes the Diſtance of the Moon from Two Stars, or the Sun and a Star, or, when the Moon is between 90 and 120° Diſtance from the Sun, from the Sun and Two Stars, if he can be ſo lucky as to obtain theſe ſeveral Obſervations.

The Longitude being computed from the Obſervations made with each Star reſpectively, the Mean of the Reſults is to be taken as probably approaching neareſt to the true Longitude. In particular the Moon's Diſtance ſhould be taken from Two Stars, or the Sun and a Star on each Side of her, as often as Opportunity permits, ſince the Mean of the Reſults will probably be at leaſt as exact again as either ſeparately, I mean as far as depends on any Imperfection of the Inſtruments, and unavoidable ſmall Errors ariſing in the Uſe of them; Errors of theſe Kinds having a natural tendency to correct each other; for that ſmall Error which ariſes from the lunar Tables will affect the Reſult from either Star equally. But the Error of Mr. Mayer's laſt lunar Tables here made uſe of, ſcarce ever exceeding 1′ at the moſt, and ſeldom amounting to 20″. the Uncertainty hence ariſing in the Determination of the Longitude can ſcarcely exceed half a Degree, and generally will not exceed 10 Miles.

The Diſtances ſet down in the Ephemeris, afford the Obſerver a ready Means of knowing the Star from which the Moon's Diſtance is to be obſerved; for he has nothing to do but to ſet his Quadrant to the Diſtance computed roughly from the Ephemeris, neglecting the Seconds, at the apparent Time eſtimated nearly by the Meridian of Greenwich; and direct his Sight to the Eaſt or Weſt of the Moon, according as the Diſtance at Greenwich is found in Page 9 and

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10, or in Two laſt Pages of the Month; and having found the Moon upon the little Speculum, let him give a Sweep with the Quadrant to the Right and Left, and he will find the Star he ſeeks for, if above the Horizon and the Air be clear, nearly in a Line perpendicular to the Line of the Moon's Horns or longer Axis, or, which is the ſame Thing, in the Line of the Moon's ſhorter Axis produced. The Star is always one of the brighteſt, ſo that there is little Danger of miſtaking another for it, if the preceding Directions are carefully obſerved. The Time at Greenwich is eſtimated nearly by turning the ſuppoſed Longitude from Greenwich into Time, by Table Page 6, 7, and 8, and adding it to or ſubſtracting it from the Apparent Time at the Ship, as its Longitude is Weſt or Eaſt of Greenwich. It will be ſufficient if the Diſtance be computed from the Ephemeris within 10′ or 20′. for ſetting the Quadrant. The principal Uſe of the Diſtances of the Moon from the Sun and fixed Stars; namely, in determining the Longitude by Compariſon with the correſponding Diſtances obſerved at Sea, will be ſhewn hereafter in its proper Order, in the Diſſertation explaining the Method of computing the Longitude at Sea by the Help of the Ephemeris.

The Diſtances contained in the Ephemeris were computed ſtrictly to Noon and Midnight, and thence interpolated for every Three Hours, according to the Method ſhewn for computing the Moon's Latitude, Page 17—19: Except that the Correction of ſecond Differences at the Middle of the Interval to be interpolated, was taken $\frac{1}{8}$ of the Mean of the Two ſecond Differences, and at the firſt and third Quarter of the Interval was taken $\frac{3}{4}$ of the Correction juſt found at the Middle of the Interval; inſtead of conſulting Table Page 11, which would however have given the ſame Reſult. But, at the firſt 12 Hours when the Diſtances of the Moon from a Star begin, and the laſt 12 Hours when the Diſtances end, there being only One ſecond Difference inſtead of Two ſecond Differences on each Side to take a Mean of, this Method fails in theſe Caſes, and therefore the following is to be ſubſtituted in its ſtead, being derived from Sir Iſaac Newton's Solution of the Problem of drawing a Curve through the Extremities of any Number of given Ordinates. Phil. Nat. Princ. Math. Page 486. Edit. ult.

From Four Diſtances at Noon and Midnight computed ſtrictly, to interpolate Three Diſtances at the 3d, 6th, and 9th Hour of the firſt or laſt Interval.

Subſtract

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Subſtract each Diſtance from the following, for the firſt Differences, and prefix the Sign —, if the Diſtances decreaſe. Subſtract each firſt Difference thus found from the following one of the ſame Order, for the ſecond Differences: And in like Manner ſubſtract the firſt 2d Difference from the following for the third Difference; applying the Signs as in algebraic Subſtraction. Denote the firſt or laſt firſt Difference by $b$, the firſt or laſt ſecond Difference by $c$; according as the Interpolation to be made is for the firſt or laſt 12 Hours, denote alſo the third Difference by $d$; and, $a$ being put to ſignify the Diſtance at the Beginning of the Interval, the interpolated Diſtances will be as follows:

| | |
|---|---|
| At 3d Hour of firſt Interval | $a + \frac{1}{4}b - \frac{3}{32}c + \frac{7}{1280}d$ |
| At 6th Hour of firſt Interval | $a + \frac{1}{2}b - \frac{1}{8}c + \frac{1}{160}d$ |
| At 9th Hour of firſt Interval | $a + \frac{3}{4}b - \frac{3}{32}c + \frac{5}{1280}d$ |
| Or | |
| At 3d Hour of laſt Interval | $a + \frac{1}{4}b - \frac{3}{32}c - \frac{5}{1280}d$ |
| At 6th Hour of laſt Interval | $a + \frac{1}{2}b - \frac{1}{8}c - \frac{1}{160}d$ |
| At 9th Hour of laſt Interval | $a + \frac{3}{4}b - \frac{3}{32}c - \frac{7}{1280}d$ |

In adapting theſe Formulæ to Numbers, great Care muſt be taken about the right Application of the Signs. Thus if $b$, $c$ or $d$ is Negative, apply the Number expreſſing the Value of that Term of the Formula where it is found with a contrary Sign to that of the Formula.

Let me add in this Place, that if in filling up the firſt and laſt Intervals, a new ſecond Difference has been ſuppoſed in arithmetical Progreſſion with the Two given ones, in order to take a Mean between it and the firſt or laſt ſecond Difference, the Interpolation at the Middle of the Interval or 6th Hour will be had true, the ſame as if the above Formulæ had been uſed: But at the Interpolation of the firſt and third Quarter there will be an Error of $\frac{1}{1280}$ third Difference; which will be corrected, by applying $+\frac{1}{1280}d$ or third Difference, to Number found at the firſt Quarter of the Interval, and $-\frac{1}{1280}d$ to that found at the third Quarter of the Interval; equally the ſame whether it be the firſt or laſt Interval.

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# TABLES

Requiſite to be uſed with the

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# A TABLE of the Refraction of the Heavenly Bodies in Altitude.

| App. Alt. | Refrac. | App. Alt. | Refrac. | App. Alt. | Refr. | App. Alt. | Refr. | App. Alt. | Refr. |
|---|---|---|---|---|---|---|---|---|---|
| ° ′ | ′ ″ | ° ′ | ′ ″ | ° ′ | ′ ″ | ° | ′ ″ | ° ′ | ′ ″ |
| 0. 0 | 33. 0 | 4. 50 | 10. 11 | 10. 30 | 5. 0 | 26. 0 | 1. 56 | 59. 0 | 0. 34 |
| 5 | 32. 10 | 5. 0 | 9. 54 | 10. 45 | 4. 53 | 27. | 1. 51 | 60. | 33 |
| 10 | 31. 22 | 5. 10 | 9. 38 | 11. 0 | 4. 47 | 28. | 1. 47 | 61. | 32 |
| 15 | 30. 35 | 5. 20 | 9. 23 | 11. 15 | 4. 40 | 29. | 1. 42 | 62. | 30 |
| 20 | 29. 50 | 5. 30 | 9. 8 | 11. 30 | 4. 34 | 30. | 1. 38 | 63. | 29 |
| 30 | 28. 22 | 5. 40 | 8. 54 | 11. 45 | 4. 29 | 31. | 1. 35 | 64. | 28 |
| 32 | 28. 5 | 5. 50 | 8. 41 | 12. 0 | 4. 23 | 32. | 1. 31 | 65. | 26 |
| 36 | 27. 30 | 6. 0 | 8. 28 | 12. 20 | 4. 16 | 33. | 1. 28 | 66. | 25 |
| 40 | 27. 0 | 6. 10 | 8. 15 | 12. 40 | 4. 9 | 34. | 1. 24 | 67. | 24 |
| 50 | 25. 42 | 6. 20 | 8. 3 | 13. 0 | 4. 3 | 35. | 1. 21 | 68. | 23 |
| 1. 0 | 24. 29 | 6. 30 | 7. 51 | 13. 20 | 3. 57 | 36. | 1. 18 | 69. | 22 |
| 1. 10 | 23. 20 | 6. 40 | 7. 40 | 13. 40 | 3. 51 | 37. | 1. 16 | 70. | 21 |
| 1. 20 | 22. 15 | 6. 50 | 7. 30 | 14. 0 | 3. 45 | 38. | 1. 13 | 71. | 19 |
| 1. 30 | 21. 15 | 7. 0 | 7. 20 | 14. 20 | 3. 40 | 39. | 1. 10 | 72. | 18 |
| 1. 40 | 20. 18 | 7. 10 | 7. 11 | 14. 40 | 3. 35 | 40. | 1. 8 | 73. | 17 |
| 1. 50 | 19. 25 | 7. 20 | 7. 2 | 15. 0 | 3. 30 | 41. | 1. 5 | 74. | 16 |
| 2. 0 | 18. 35 | 7. 30 | 6. 53 | 15. 30 | 3. 24 | 42. | 1. 3 | 75. | 15 |
| 2. 10 | 17. 48 | 7. 40 | 6. 45 | 16. 0 | 3. 17 | 43. | 1. 1 | 76. | 14 |
| 2. 20 | 17. 4 | 7. 50 | 6. 37 | 16. 30 | 3. 10 | 44. | 59 | 77. | 13 |
| 2. 30 | 16. 24 | 8. 0 | 6. 29 | 17. 0 | 3. 4 | 45. | 57 | 78. | 12 |
| 2. 40 | 15. 45 | 8. 10 | 6. 22 | 17. 30 | 2. 59 | 46. | 55 | 79. | 11 |
| 2. 50 | 15. 9 | 8. 20 | 6. 15 | 18. 0 | 2. 54 | 47. | 53 | 80. | 10 |
| 3. 0 | 14. 36 | 8. 30 | 6. 8 | 18. 30 | 2. 49 | 48. | 51 | 81. | 9 |
| 3. 10 | 14. 4 | 8. 40 | 6. 1 | 19. 0 | 2. 44 | 49. | 49 | 82. | 8 |
| 3. 20 | 13. 34 | 8. 50 | 5. 55 | 19. 30 | 2. 39 | 50. | 48 | 83. | 7 |
| 3. 30 | 13. 6 | 9. 0 | 5. 48 | 20. 0 | 2. 35 | 51. | 46 | 84. | 6 |
| 3. 40 | 12. 40 | 9. 10 | 5. 42 | 20. 30 | 2. 31 | 52. | 44 | 85. | 5 |
| 3. 50 | 12. 15 | 9. 20 | 5. 36 | 21. 0 | 2. 27 | 53. | 43 | 86. | 4 |
| 4. 0 | 11. 51 | 9. 30 | 5. 31 | 21. 30 | 2. 24 | 54. | 41 | 87. | 3 |
| 4. 10 | 11. 28 | 9. 40 | 5. 25 | 22. 0 | 2. 20 | 55. | 40 | 88. | 2 |
| 4. 20 | 11. 8 | 9. 50 | 5. 20 | 23. 0 | 2. 14 | 56. | 38 | 89. | 1 |
| 4. 30 | 10. 48 | 10. 0 | 5. 15 | 24. 0 | 2. 7 | 57. | 37 | 90. | 0 |
| 4. 40 | 10. 29 | 10. 15 | 5. 7 | 25. 0 | 2. 2 | 58. | 35 | | |

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# A TABLE of the Moon's Parallax in Altitude.

| App. Alt. of ☽ | Horizontal Parallax of the Moon. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ° | 53′ | 54′ | 55′ | 56′ | 57′ | 58′ | 59′ | 60′ | 61′ | 62′ |
| 1 | 53′ | 54′ | 55′ | 56′ | 57′ | 58′ | 59′ | 60′ | 61′ | 62′ |
| 2 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |
| 3 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |
| 4 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |
| 5 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |
| 6 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |
| 7 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 |
| 8 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| 9 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| 10 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| 11 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| 12 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 |
| 13 | 52 | 53 | 54 | 55 | 55 | 56 | 57 | 58 | 59 | 60 |
| 14 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 15 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 16 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 58 | 59 |
| 17 | 51 | 52 | 53 | 54 | 54 | 55 | 56 | 57 | 58 | 59 |
| 18 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
| 19 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
| 20 | 50 | 51 | 52 | 53 | 54 | 54 | 55 | 56 | 57 | 58 |
| 21 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 |
| 22 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 56 | 57 |
| 23 | 49 | 50 | 51 | 51 | 52 | 53 | 54 | 55 | 56 | 57 |
| 24 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 |
| 25 | 48 | 49 | 50 | 51 | 52 | 53 | 53 | 54 | 55 | 56 |
| 26 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 |
| 27 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 53 | 54 | 55 |
| 28 | 47 | 48 | 49 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 29 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 52 | 53 | 54 |
| 30 | 46 | 47 | 48 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |



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Continuation of the TABLE of the Moon's Parallax in Altitude.

| App. Alt. of ☽ | Horizontal Parallax of the Moon. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ° | 53′ | 54′ | 55′ | 56′ | 57′ | 58′ | 59′ | 60′ | 61′ | 62′ |
| 31 | 45′ | 46′ | 47′ | 48′ | 49′ | 50′ | 51′ | 51′ | 52′ | 53′ |
| 32 | 45 | 46 | 47 | 47 | 48 | 49 | 50 | 51 | 52 | 53 |
| 33 | 44 | 45 | 46 | 47 | 48 | 49 | 49 | 50 | 51 | 52 |
| 34 | 44 | 45 | 46 | 46 | 47 | 48 | 49 | 50 | 51 | 52 |
| 35 | 43 | 44 | 45 | 46 | 47 | 47 | 48 | 49 | 50 | 51 |
| 36 | 43 | 44 | 44 | 45 | 46 | 47 | 48 | 48 | 49 | 50 |
| 37 | 42 | 43 | 44 | 45 | 45 | 46 | 47 | 48 | 49 | 50 |
| 38 | 42 | 43 | 43 | 44 | 45 | 46 | 46 | 47 | 48 | 49 |
| 39 | 41 | 42 | 43 | 43 | 44 | 45 | 46 | 47 | 47 | 48 |
| 40 | 40 | 41 | 42 | 43 | 44 | 44 | 45 | 46 | 47 | 48 |
| 41 | 40 | 41 | 41 | 42 | 43 | 44 | 44 | 45 | 46 | 47 |
| 42 | 39 | 40 | 41 | 42 | 42 | 43 | 44 | 45 | 45 | 46 |
| 43 | 38 | 39 | 40 | 41 | 42 | 42 | 43 | 44 | 45 | 46 |
| 44 | 38 | 39 | 40 | 40 | 41 | 42 | 42 | 43 | 44 | 45 |
| 45 | 37 | 38 | 39 | 40 | 40 | 41 | 42 | 43 | 43 | 44 |
| 46 | 36 | 37 | 38 | 39 | 40 | 40 | 41 | 42 | 42 | 43 |
| 47 | 36 | 37 | 38 | 38 | 39 | 40 | 40 | 41 | 42 | 43 |
| 48 | 35 | 36 | 37 | 37 | 38 | 39 | 39 | 40 | 41 | 42 |
| 49 | 34 | 35 | 36 | 37 | 37 | 38 | 39 | 39 | 40 | 41 |
| 50 | 34 | 35 | 35 | 36 | 37 | 37 | 38 | 39 | 39 | 40 |
| 51 | 33 | 34 | 35 | 35 | 36 | 36 | 37 | 38 | 38 | 39 |
| 52 | 32 | 33 | 34 | 34 | 35 | 36 | 36 | 37 | 38 | 39 |
| 53 | 31 | 32 | 33 | 34 | 34 | 35 | 35 | 36 | 37 | 38 |
| 54 | 31 | 32 | 32 | 33 | 33 | 34 | 35 | 35 | 36 | 37 |
| 55 | 30 | 31 | 31 | 32 | 33 | 33 | 34 | 34 | 35 | 36 |
| 56 | 29 | 30 | 31 | 31 | 32 | 32 | 33 | 34 | 34 | 35 |
| 57 | 28 | 29 | 30 | 30 | 31 | 32 | 32 | 33 | 33 | 34 |
| 58 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 33 |
| 59 | 27 | 28 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 32 |
| 60 | 26 | 27 | 27 | 28 | 28 | 29 | 29 | 30 | 30 | 30 |

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## Continuation of the TABLE of the Moon's Parallax in Altitude.

| App. Alt. of ☽ | Horizontal Parallax of the Moon. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ° | 53′ | 54′ | 55′ | 56′ | 57′ | 58′ | 59′ | 60′ | 61′ | 62′ |
| 61 | 26′ | 26′ | 27′ | 27′ | 28′ | 28′ | 29′ | 29′ | 30′ | 30′ |
| 62 | 25 | 25 | 26 | 26 | 27 | 27 | 28 | 28 | 29 | 29 |
| 63 | 24 | 24 | 25 | 25 | 26 | 26 | 27 | 27 | 28 | 28 |
| 64 | 24 | 24 | 24 | 24 | 25 | 25 | 26 | 26 | 27 | 27 |
| 65 | 23 | 23 | 23 | 24 | 24 | 24 | 25 | 25 | 26 | 26 |
| 66 | 22 | 22 | 22 | 23 | 23 | 24 | 24 | 24 | 25 | 25 |
| 67 | 21 | 21 | 21 | 22 | 22 | 23 | 23 | 23 | 24 | 24 |
| 68 | 20 | 20 | 21 | 21 | 21 | 22 | 22 | 22 | 23 | 23 |
| 69 | 19 | 19 | 20 | 20 | 20 | 21 | 21 | 21 | 22 | 22 |
| 70 | 18 | 18 | 19 | 19 | 19 | 20 | 20 | 20 | 21 | 21 |
| 71 | 18 | 18 | 18 | 18 | 19 | 19 | 19 | 19 | 20 | 20 |
| 72 | 17 | 17 | 17 | 17 | 18 | 18 | 18 | 18 | 19 | 19 |
| 73 | 16 | 16 | 16 | 16 | 17 | 17 | 17 | 17 | 18 | 18 |
| 74 | 15 | 15 | 15 | 15 | 16 | 16 | 16 | 16 | 17 | 17 |
| 75 | 14 | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 16 | 16 |
| 76 | 13 | 13 | 13 | 14 | 14 | 14 | 14 | 14 | 15 | 15 |
| 77 | 12 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 14 | 14 |
| 78 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 13 | 13 |
| 79 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 12 | 12 |
| 80 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 |
| 81 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 10 | 10 |
| 82 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 9 |
| 83 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 |
| 84 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 |
| 85 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 86 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 87 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 88 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 89 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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## A TABLE to turn Degrees and Minutes into Time, and the contrary.

| D. | H. M. | D. | H. M. | D. | H. M. | D. | H. M. |
|---|---|---|---|---|---|---|---|
| M. | M. S. | M. | M. S. | | | | |
| 1 | 0. 4 | 31 | 2. 4 | 61 | 4. 4 | 91 | 6. 4 |
| 2 | 0. 8 | 32 | 2. 8 | 62 | 4. 8 | 92 | 6. 8 |
| 3 | 0. 12 | 33 | 2. 12 | 63 | 4. 12 | 93 | 6. 12 |
| 4 | 0. 16 | 34 | 2. 16 | 64 | 4. 16 | 94 | 6. 16 |
| 5 | 0. 20 | 35 | 2. 20 | 65 | 4. 20 | 95 | 6. 20 |
| 6 | 0. 24 | 36 | 2. 24 | 66 | 4. 24 | 96 | 6. 24 |
| 7 | 0. 28 | 37 | 2. 28 | 67 | 4. 28 | 97 | 6. 28 |
| 8 | 0. 32 | 38 | 2. 32 | 68 | 4. 32 | 98 | 6. 32 |
| 9 | 0. 36 | 39 | 2. 36 | 69 | 4. 36 | 99 | 6. 36 |
| 10 | 0. 40 | 40 | 2. 40 | 70 | 4. 40 | 100 | 6. 40 |
| 11 | 0. 44 | 41 | 2. 44 | 71 | 4. 44 | 101 | 6. 44 |
| 12 | 0. 48 | 42 | 2. 48 | 72 | 4. 48 | 102 | 6. 48 |
| 13 | 0. 52 | 43 | 2. 52 | 73 | 4. 52 | 103 | 6. 52 |
| 14 | 0. 56 | 44 | 2. 56 | 74 | 4. 56 | 104 | 6. 56 |
| 15 | 1. 0 | 45 | 3. 0 | 75 | 5. 0 | 105 | 7. 0 |
| 16 | 1. 4 | 46 | 3. 4 | 76 | 5. 4 | 106 | 7. 4 |
| 17 | 1. 8 | 47 | 3. 8 | 77 | 5. 8 | 107 | 7. 8 |
| 18 | 1. 12 | 48 | 3. 12 | 78 | 5. 12 | 108 | 7. 12 |
| 19 | 1. 16 | 49 | 3. 16 | 79 | 5. 16 | 109 | 7. 16 |
| 20 | 1. 20 | 50 | 3. 20 | 80 | 5. 20 | 110 | 7. 20 |
| 21 | 1. 24 | 51 | 3. 24 | 81 | 5. 24 | 111 | 7. 24 |
| 22 | 1. 28 | 52 | 3. 28 | 82 | 5. 28 | 112 | 7. 28 |
| 23 | 1. 32 | 53 | 3. 32 | 83 | 5. 32 | 113 | 7. 32 |
| 24 | 1. 36 | 54 | 3. 36 | 84 | 5. 36 | 114 | 7. 36 |
| 25 | 1. 40 | 55 | 3. 40 | 85 | 5. 40 | 115 | 7. 40 |
| 26 | 1. 44 | 56 | 3. 44 | 86 | 5. 44 | 116 | 7. 44 |
| 27 | 1. 48 | 57 | 3. 48 | 87 | 5. 48 | 117 | 7. 48 |
| 28 | 1. 52 | 58 | 3. 52 | 88 | 5. 52 | 118 | 7. 52 |
| 29 | 1. 56 | 59 | 3. 56 | 89 | 5. 56 | 119 | 7. 56 |
| 30 | 2. 0 | 60 | 4. 0 | 90 | 6. 0 | 120 | 8. 0 |

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Continuation of the TABLE for turning Degrees and Minutes into Time, and the contrary.

| D. | H. M. | D. | H. M. | D. | H. M. | D. | H. M. |
|---|---|---|---|---|---|---|---|
| 121 | 8. 4 | 151 | 10. 4 | 181 | 12. 4 | 211 | 14. 4 |
| 122 | 8. 8 | 152 | 10. 8 | 182 | 12. 8 | 212 | 14. 8 |
| 123 | 8. 12 | 153 | 10. 12 | 183 | 12. 12 | 213 | 14. 12 |
| 124 | 8. 16 | 154 | 10. 16 | 184 | 12. 16 | 214 | 14. 16 |
| 125 | 8. 20 | 155 | 10. 20 | 185 | 12. 20 | 215 | 14. 20 |
| 126 | 8. 24 | 156 | 10. 24 | 186 | 12. 24 | 216 | 14. 24 |
| 127 | 8. 28 | 157 | 10. 28 | 187 | 12. 28 | 217 | 14. 28 |
| 128 | 8. 32 | 158 | 10. 32 | 188 | 12. 32 | 218 | 14. 32 |
| 129 | 8. 36 | 159 | 10. 36 | 189 | 12. 36 | 219 | 14. 36 |
| 130 | 8. 40 | 160 | 10. 40 | 190 | 12. 40 | 220 | 14. 40 |
| 131 | 8. 44 | 161 | 10. 44 | 191 | 12. 44 | 221 | 14. 44 |
| 132 | 8. 48 | 162 | 10. 48 | 192 | 12. 48 | 222 | 14. 48 |
| 133 | 8. 52 | 163 | 10. 52 | 193 | 12. 52 | 223 | 14. 52 |
| 134 | 8. 56 | 164 | 10. 56 | 194 | 12. 56 | 224 | 14. 56 |
| 135 | 9. 0 | 165 | 11. 0 | 195 | 13. 0 | 225 | 15. 0 |
| 136 | 9. 4 | 166 | 11. 4 | 196 | 13. 4 | 226 | 15. 4 |
| 137 | 9. 8 | 167 | 11. 8 | 197 | 13. 8 | 227 | 15. 8 |
| 138 | 9. 12 | 168 | 11. 12 | 198 | 13. 12 | 228 | 15. 12 |
| 139 | 9. 16 | 169 | 11. 16 | 199 | 13. 16 | 229 | 15. 16 |
| 140 | 9. 20 | 170 | 11. 20 | 200 | 13. 20 | 230 | 15. 20 |
| 141 | 9. 24 | 171 | 11. 24 | 201 | 13. 24 | 231 | 15. 24 |
| 142 | 9. 28 | 172 | 11. 28 | 202 | 13. 28 | 232 | 15. 28 |
| 143 | 9. 32 | 173 | 11. 32 | 203 | 13. 32 | 233 | 15. 32 |
| 144 | 9. 36 | 174 | 11. 36 | 204 | 13. 36 | 234 | 15. 36 |
| 145 | 9. 40 | 175 | 11. 40 | 205 | 13. 40 | 235 | 15. 40 |
| 146 | 9. 44 | 176 | 11. 44 | 206 | 13. 44 | 236 | 15. 44 |
| 147 | 9. 48 | 177 | 11. 48 | 207 | 13. 48 | 237 | 15. 48 |
| 148 | 9. 52 | 178 | 11. 52 | 208 | 13. 52 | 238 | 15. 52 |
| 149 | 9. 56 | 179 | 11. 56 | 209 | 13. 56 | 239 | 15. 56 |
| 150 | 10. 0 | 180 | 12. 0 | 210 | 14. 0 | 240 | 16. 0 |

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Continuation of the TABLE for turning Degrees and Minutes into Time, and the contrary.

| D. | H. M. | D. | H. M. | D. | H. M. | D. | H. M. |
|---|---|---|---|---|---|---|---|
| 241 | 16. 4 | 271 | 18. 4 | 301 | 20. 4 | 331 | 22. 4 |
| 242 | 16. 8 | 272 | 18. 8 | 302 | 20. 8 | 332 | 22. 8 |
| 243 | 16. 12 | 273 | 18. 12 | 303 | 20. 12 | 333 | 22. 12 |
| 244 | 16. 16 | 274 | 18. 16 | 304 | 20. 16 | 334 | 22. 16 |
| 245 | 16. 20 | 275 | 18. 20 | 305 | 20. 20 | 335 | 22. 20 |
| 246 | 16. 24 | 276 | 18. 24 | 306 | 20. 24 | 336 | 22. 24 |
| 247 | 16. 28 | 277 | 18. 28 | 307 | 20. 28 | 337 | 22. 28 |
| 248 | 16. 32 | 278 | 18. 32 | 308 | 20. 32 | 338 | 22. 32 |
| 249 | 16. 36 | 279 | 18. 36 | 309 | 20. 36 | 339 | 22. 36 |
| 250 | 16. 40 | 280 | 18. 40 | 310 | 20. 40 | 340 | 22. 40 |
| 251 | 16. 44 | 281 | 18. 44 | 311 | 20. 44 | 341 | 22. 44 |
| 252 | 16. 48 | 282 | 18. 48 | 312 | 20. 48 | 342 | 22. 48 |
| 253 | 16. 52 | 283 | 18. 52 | 313 | 20. 52 | 343 | 22. 52 |
| 254 | 16. 56 | 284 | 18. 56 | 314 | 20. 56 | 344 | 22. 56 |
| 255 | 17. 0 | 285 | 19. 0 | 315 | 21. 0 | 345 | 23. 0 |
| 256 | 17. 4 | 286 | 19. 4 | 316 | 21. 4 | 346 | 23. 4 |
| 257 | 17. 8 | 287 | 19. 8 | 317 | 21. 8 | 347 | 23. 8 |
| 258 | 17. 12 | 288 | 19. 12 | 318 | 21. 12 | 348 | 23. 12 |
| 259 | 17. 16 | 289 | 19. 16 | 319 | 21. 16 | 349 | 23. 16 |
| 260 | 17. 20 | 290 | 19. 20 | 320 | 21. 20 | 350 | 23. 20 |
| 261 | 17. 24 | 291 | 19. 24 | 321 | 21. 24 | 351 | 23. 24 |
| 262 | 17. 28 | 292 | 19. 28 | 322 | 21. 28 | 352 | 23. 28 |
| 263 | 17. 32 | 293 | 19. 32 | 323 | 21. 32 | 353 | 23. 32 |
| 264 | 17. 36 | 294 | 19. 36 | 324 | 21. 36 | 354 | 23. 36 |
| 265 | 17. 40 | 295 | 19. 40 | 325 | 21. 40 | 355 | 23. 40 |
| 266 | 17. 44 | 296 | 19. 44 | 326 | 21. 44 | 356 | 23. 44 |
| 267 | 17. 48 | 297 | 19. 48 | 327 | 21. 48 | 357 | 23. 48 |
| 268 | 17. 52 | 298 | 19. 52 | 328 | 21. 52 | 358 | 23. 52 |
| 269 | 17. 56 | 299 | 19. 56 | 329 | 21. 56 | 359 | 23. 56 |
| 270 | 18. 0 | 300 | 20. 0 | 330 | 22. 0 | 360 | 24. 0 |

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# A CORRECT TABLE
## OF THE
## Longitude and Latitude of the principal Zodiacal Stars proper to take the Moon's Diſtance from, for finding the Longitude at Sea.
## Deduced from Dr. Bradley's Obſervations.

| Beginning of 1767. | Magnitud. | Longitude. S. ° ′ ″ | Latitude. ° ′ ″ |
|---|---|---|---|
| γ Pegaſi | 2 | 0. 5. 54. 38 | 12. 35. 35 N |
| * α Arietis | 2 | 1. 4. 24. 20 | 9. 57. 30 N |
| α Ceti | 2 | 1. 11. 3. 56 | 12. 36. 16 S |
| * Aldebaran | 1 | 2. 6. 32. 3 | 5. 29. 2 S |
| β Tauri | 2 | 2. 19. 19. 19 | 5. 21. 59 N |
| α Orionis | 1 | 2. 25. 30. 5 | 16. 3. 31 S |
| * Pollux | 1. 2 | 3. 20. 0. 16 | 6. 40. 5 N |
| Procyon | 1 | 3. 22. 34. 29 | 15. 58. 8 S |
| * Regulus | 1 | 4. 26. 35. 31 | 0. 27. 27 N |
| β Leonis | 2 | 5. 18. 23. 9 | 12. 17. 8 N |
| * Spica Virginis | 1 | 6. 20. 35. 31 | 2. 2. 11 S |
| α Libræ | 2 | 7. 11. 50. 11 | 0. 21. 48 N |
| β Libræ | 2 | 7. 16. 7. 23 | 8. 31. 32 N |
| * Antares | 1 | 8. 6. 30. 40 | 4. 32. 17 S |
| σ Sagittarii | 2. 3 | 9. 9. 7. 59 | 3. 24. 55 S |
| * α Aquilæ | 1 | 9. 28. 29. 13 | 29. 18. 36 N |
| * β Capricorni | 3 | 10. 0. 47. 37 | 4. 36. 46 N |
| * Fomalhaut | 1 | 11. 0. 34. 47 | 21. 6. 28 S |
| * α Pegaſi | 2 | 11. 20. 14. 30 | 19. 24. 38 N |

N. B. Thoſe Stars only marked with Aſteriſcs are made uſe of in the Diſtances of the Aſtronomical and Nautical Ephemeris.



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## TABLE to find the Aberration of a Zodiacal Star in Longitude.

| Aberration * in Longitude. | | | | |
|---|---|---|---|---|
| Arg. Long. ☉ —— Long. * | | | | |
| Sign. | 0 — | 1 — | 2 — | |
| Sig. | 6 + | 7 + | 8 + | |
| ° | // | // | // | ° |
| 0 | 20 | 17 | 10 | 30 |
| 3 | 20 | 17 | 9 | 27 |
| 6 | 20 | 16 | 8 | 24 |
| 9 | 20 | 16 | 7 | 21 |
| 12 | 20 | 15 | 6 | 18 |
| 15 | 19 | 14 | 5 | 15 |
| 18 | 19 | 13 | 4 | 12 |
| 21 | 19 | 13 | 3 | 9 |
| 24 | 18 | 12 | 2 | 6 |
| 27 | 18 | 11 | 1 | 3 |
| 30 | 17 | 19 | 0 | 0 |
| Sig. | 11 — | 10 — | 9 — | |
| Sig. | 5 + | 4 + | 3 + | |

## A particular Table of Limits for α Aquilæ.

| ☽ Lat. N. | Dif. of Lon. ☽ & α Aqui. | ☽ Lat. S. | Dif. of Lon. ☽ & α Aqui. |
|---|---|---|---|
| ° | ° ′ | ° | ° ′ |
| 0 | 48. 26 | 0 | 48. 26 |
| 1 | 47. 15 | 1 | 49. 45 |
| 2 | 45. 43 | 2 | 51. 3 |
| 3 | 44. 11 | 3 | 52. 10 |
| 4 | 42. 43 | 4 | 53. 21 |
| 5 | 41. 19 | 5 | 54. 26 |
| 5°. 20′ | 40. 38 | 5°. 20′ | 54. 46 |

## A TABLE for chusing proper Stars for observing the Moon's Dist. from.

| Dif. or Sum of ☽ & * Lats. | Dif. of Lon. of ☽ & *. |
|---|---|
| ° | ° ′ |
| 1 | 10. 0 |
| 2 | 10. |
| 3 | 10. |
| 4 | 10. |
| 5 | 10. |
| 6 | 10. 57 |
| 7 | 12. 49 |
| 8 | 14. 42 |
| 9 | 16. 37 |
| 10 | 18. 34 |
| 11 | 20. 33 |
| 12 | 22. 35 |
| 13 | 24. 39 |
| 14 | 26. 46 |
| 15 | 28. 57 |
| 16 | 31. 12 |
| 17 | 33. 31 |
| 18 | 35. 56 |
| 19 | 38. 28 |
| 20 | 41. 6 |
| 21 | 43. 54 |
| 22 | 46. 52 |
| 23 | 50. 3 |
| 24 | 53. 32 |
| 25 | 57. 23 |
| 26 | 61. 49 |
| 27 | 66. 58 |
| 28 | 73. 48 |

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A TABLE for finding the Correction of the Moon's Longitude or Latitude, obtained by Proportion from the Places calculated for Noon and Midnight.

| App. Time after Noon or Midnight. | Second Difference of Moon's Place. | | | | | | | | | | App. Time after Noon or Midnight. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1′ | 2′ | 3′ | 4′ | 5′ | 6′ | 7′ | 8′ | 9′ | 10′ | |
| H. M. | // | // | // | // | // | // | // | // | // | // | H. M. |
| 0. 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12. 0 |
| 0. 10 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 11. 50 |
| 0. 20 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 | 8 | 11. 40 |
| 0. 30 | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 10 | 11 | 12 | 11. 30 |
| 0. 40 | 2 | 3 | 5 | 6 | 8 | 9 | 11 | 13 | 14 | 16 | 11. 20 |
| 0. 50 | 2 | 4 | 6 | 8 | 10 | 12 | 13 | 15 | 17 | 19 | 11. 10 |
| 1. 0 | 2 | 5 | 7 | 9 | 11 | 14 | 16 | 18 | 21 | 23 | 11. 0 |
| 1. 10 | 3 | 5 | 8 | 10 | 13 | 16 | 18 | 21 | 24 | 26 | 10. 50 |
| 1. 20 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 10. 40 |
| 1. 30 | 3 | 6 | 10 | 13 | 16 | 20 | 23 | 26 | 29 | 33 | 10. 30 |
| 1. 40 | 4 | 7 | 11 | 14 | 18 | 21 | 25 | 29 | 32 | 36 | 10. 20 |
| 1. 50 | 4 | 8 | 12 | 15 | 19 | 23 | 27 | 31 | 35 | 39 | 10. 10 |
| 2. 0 | 4 | 8 | 12 | 17 | 21 | 25 | 29 | 33 | 37 | 42 | 10. 0 |
| 2. 10 | 4 | 9 | 13 | 18 | 22 | 27 | 31 | 35 | 40 | 44 | 9. 50 |
| 2. 20 | 5 | 9 | 14 | 19 | 23 | 28 | 33 | 38 | 42 | 47 | 9. 40 |
| 2. 30 | 5 | 10 | 15 | 20 | 25 | 30 | 34 | 39 | 44 | 49 | 9. 30 |
| 2. 40 | 5 | 10 | 15 | 21 | 26 | 31 | 36 | 41 | 47 | 52 | 9. 20 |
| 2. 50 | 5 | 11 | 16 | 22 | 27 | 32 | 38 | 43 | 49 | 54 | 9. 10 |
| 3. 0 | 6 | 11 | 17 | 23 | 28 | 34 | 39 | 45 | 51 | 56 | 9. 0 |
| 3. 10 | 6 | 12 | 17 | 23 | 29 | 35 | 41 | 46 | 52 | 58 | 8. 50 |
| 3. 20 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 8. 40 |
| 3. 30 | 6 | 12 | 18 | 25 | 31 | 37 | 43 | 49 | 56 | 62 | 8. 30 |
| 3. 40 | 6 | 13 | 19 | 25 | 32 | 38 | 45 | 51 | 57 | 64 | 8. 20 |
| 3. 50 | 6 | 13 | 19 | 26 | 33 | 39 | 46 | 52 | 59 | 65 | 8. 10 |
| 4. 0 | 7 | 13 | 20 | 27 | 33 | 40 | 47 | 53 | 60 | 67 | 8. 0 |
| 4. 10 | 7 | 14 | 20 | 27 | 34 | 41 | 47 | 54 | 61 | 68 | 7. 50 |
| 4. 20 | 7 | 14 | 21 | 28 | 35 | 41 | 48 | 55 | 62 | 69 | 7. 40 |
| 4. 30 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 7. 30 |
| 4. 40 | 7 | 14 | 21 | 28 | 36 | 43 | 50 | 57 | 64 | 71 | 7. 20 |
| 4. 50 | 7 | 14 | 22 | 29 | 36 | 43 | 50 | 58 | 65 | 72 | 7. 10 |
| 5. 0 | 7 | 15 | 22 | 29 | 36 | 44 | 51 | 58 | 66 | 73 | 7. 0 |
| 5. 30 | 7 | 15 | 22 | 30 | 37 | 45 | 52 | 60 | 67 | 74 | 6. 30 |
| 6. 0 | 7 | 15 | 22 | 30 | 37 | 45 | 52 | 60 | 67 | 75 | 6. 0 |

Add the Correction to the Moon's Longitude or Latitnde, when the Motion in 12 Hours is decreasing; and subtract it from the same, when the Motion in 12 Hours is increasing.



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## A CATALOGUE of the Right Aſcenſions and Declinations of the principal fixed Stars of the firſt and ſecond Magnitude, adapted to the Year 1767, with their Variations in Ten Years.

| Names of the Stars. | Character. | Magnitude | Rt. Aſcenſion. | Rt. Aſcen. increaſes in 10 Years. | Declination. | Decl. increaſes or diminiſh in 10 Years. |
|---|---|---|---|---|---|---|
| | | | ° ′ | ′ ″ | ° ′ | ′ ″ |
| Extremity of the Wing of Pegaſus, *Algenib*, | γ | 2 | 0. 19 | 7. 42 | 13. 54 N | +3. 20 |
| In the Head of the Phœnix, | α | 2 | 3. 41 | 7. 30 | 43. 34 S | —3. 20 |
| The bright Star in the Tail of the Whale, | β | 2 | 7. 59 | 7. 32 | 19. 16 S | —3. 18 |
| In the Girdle of Andromeda, | β | 2 | 14. 11 | 8. 14 | 34. 23 N | +3. 14 |
| The Spring of the River Eridanus, *Achernar*, | α | 1 | 22. 15 | 5. 37 | 58. 25 S | —3. 5 |
| In the Jaw of the Whale, | α | 2 | 42. 32 | 7. 49 | 3. 10 N | +2. 28 |
| In the Head of Meduſa, *Algol*, | β | 2 | 43. 7 | 9. 36 | 40. 3 N | +2. 26 |
| The bright Star of Perſeus, | α | 2 | 46. 58 | 10. 29 | 49. 1 N | +2. 17 |
| The South Eye of the Bull, *Aldebaran*, | α | 1 | 65. 39 | 8. 34 | 16. 1 N | +1. 23 |
| The bright Star in the Left Shoulder of Auriga, *Capella*, | α | 1 | 74. 52 | 11. 0 | 45. 44 N | +0. 53 |
| The bright Foot of Orion, *Rigel*, | β | 1 | 75. 44 | 7. 12 | 8. 29 S | —0. 50 |
| The North Horn of the Bull, | β | 2 | 77. 44 | 9. 27 | 28. 23 N | +0. 43 |
| The Weſtern Shoulder of Orion, | γ | 2 | 78. 10 | 8. 3 | 6. 7 N | +0. 42 |
| Bright Star in the Dove, | α | 2 | 82. 48 | 5. 30 | 34. 13 S | —0. 25 |
| The Eaſtern Shoulder of Orion, | α | 1 | 85. 39 | 8. 7 | 7. 21 N | +0. 16 |
| The bright Star in the Poop of the Ship Argo, *Canobus*, | α | 1 | 94. 42 | 3. 21 | 52. 34 S | +0. 16 |
| The bright Star in the Dog's Mouth, *Sirius* | α | 1 | 98. 44 | 6. 43 | 16. 24 S | +0. 30 |
| In the Head of the Northern Twin, *Caſtor*, | α | 1 | 109. 55 | 9. 41 | 32. 23 N | —1. 7 |
| The little Dog, *Procyon*, | α | 1 | 111. 47 | 8. 0 | 5. 49 N | —1. 13 |
| In the Head of the Southern Twin, *Pollux*, | β | 1 | 112. 46 | 9. 23 | 28. 35 N | —1. 17 |



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| | | | | | | |
|---|---|---|---|---|---|---|
| The bright Star in the Oars of the Ship Argo, | β | 1 | 137. 0 | 1. 52 | 68. 46 S | +2. 28 |
| The Heart of the Female Hydra, | α | 2 | 139. 3 | 7. 24 | 7. 40 S | +2. 31 |
| The Lion's Heart, *Regulus*, | α | 1 | 148. 59 | 8. 6 | 13. 5 N | −2. 51 |
| Northermoſt Star in the Square of the great Bear, | α | 2 | 162. 17 | 9. 44 | 63. 0 N | −3. 10 |
| The Lion's Tail, | β | 2 | 174. 18 | 7. 47 | 15. 52 N | −3. 19 |
| Southermoſt Star of the Croſiers, or the Foot of the Croſs, | α | 1 | 183. 28 | 8. 3 | 61. 49 S | +3. 20 |
| The Virgin's Spike, | α | 1 | 198. 15 | 7. 52 | 9. 56 S | +3. 10 |
| The laſt Star in the Tail of the great Bear, | η | 2 | 204. 35 | 6. 1 | 50. 29 N | −3. 2 |
| The Weſtermoſt Foot of the Centaur, | β | 2 | 206. 54 | 10. 13 | 59. 14 S | +2. 59 |
| The bright Star in Bootes, *Arcturus*, | α | 1 | 211. 16 | 7. 3 | 20. 24 N | −2. 52 |
| The bright Star in the Eaſtern Foot of the Centaur, | α | 1 | 216. 1 | 11. 1 | 59. 52 S | +2. 42 |
| The Southern Scale of Libra, | α | 2 | 219. 31 | 8. 16 | 15. 4 S | +2. 35 |
| The Northern Star of Libra, | β | 2 | 226. 8 | 8. 3 | 8. 31 S | +2. 20 |
| The bright Star of the Crown, | α | 2 | 231. 14 | 6. 20 | 27. 30 N | −2. 6 |
| The Northermoſt Star of the Scorpion's Forehead, | β | 2 | 237. 59 | 8. 40 | 19. 8 S | +1. 47 |
| The Scorpion's Heart, *Antares*, | α | 1 | 243. 47 | 9. 8 | 25. 53 S | +1. 29 |
| In the Eaſtern Knee of Ophiuchus, | η | 2 | 254. 16 | 8. 36 | 15. 25 S | +0. 55 |
| The Head of Ophiuchus, | α | 2 | 261. 2 | 6. 57 | 12. 45 N | −0. 32 |
| The bright Star of the Harp, *Lyra*, | α | 1 | 277. 16 | 5. 3 | 38. 35 N | +0. 25 |
| The bright Star of the Eagle, *Atair*, | α | 2 | 294. 52 | 7. 15 | 8. 16 N | +1. 23 |
| The Eye of the Peacock, | α | 2 | 301. 47 | 12. 13 | 57. 28 S | −1. 44 |
| The Tail of the Swan, | α | 2 | 308. 22 | 5. 7 | 44. 27 N | +2. 4 |
| The Weſtermoſt Wing of the Crane, | α | 2 | 328. 23 | 9. 56 | 48. 4 S | −2. 50 |
| In the Mouth of the Southern Fiſh, *Fomalhaut*, | α | 1 | 341. 11 | 8. 21 | 30. 51 S | −3. 9 |
| In the Shoulder of Pegaſus, | β | 2 | 343. 8 | 7. 12 | 26. 50 N | +3. 11 |
| In the Wing of Pegaſus, *Markab*, | α | 1 | 343. 18 | 7. 27 | 13. 58 N | +3. 12 |
| The Head of Andromeda, | α | 2 | 359. 6 | 7. 42 | 27. 48 N | +3. 20 |

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## A TABLE of the Multipliers of the Difference between the Moon's Longitude computed, and that inferred from Observation, to find the Error of the Ship's Account in Longitude.

Enter with hourly Motion of ☽, or Difference of hourly Motions of ☉ and ☽, according as ☽'s Distance is taken from a Star or the Sun.

| Ho. Mo. ☽ or diffe. Ho. Mo. ☉ & ☽ | Multipliers. | Ho. Mo. ☽ or diffe. Ho. Mo. ☉ & ☽ | Multipliers. |
|---|---|---|---|
| ′ ″ | | ′ ″ | |
| 25. 45 | 35,0 | | |
| 26. 0 | 34,6 | 32. 0 | 28,1 |
| 26. 15 | 34,3 | 32. 15 | 27,9 |
| 26. 30 | 34,0 | 32. 30 | 27,7 |
| 26. 45 | 33,6 | 32. 45 | 27,5 |
| 27. 0 | 33,3 | 33. 0 | 27,3 |
| 27. 15 | 33,0 | 33. 15 | 27,1 |
| 27. 30 | 32,7 | 33. 30 | 26,9 |
| 27. 45 | 32,4 | 33. 45 | 26,7 |
| 28. 0 | 32,1 | 34. 0 | 26,5 |
| 28. 15 | 31,8 | 34. 15 | 26,3 |
| 28. 30 | 31,6 | 34. 30 | 26,1 |
| 28. 45 | 31,3 | 34. 45 | 25,9 |
| 29. 0 | 31,0 | 35. 0 | 25,7 |
| 29. 15 | 30,8 | 35. 15 | 25,5 |
| 29. 30 | 30,5 | 35. 30 | 25,3 |
| 29. 45 | 30,2 | 35. 45 | 25,2 |
| 30. 0 | 30,0 | 36. 0 | 25,0 |
| 30. 15 | 29,7 | 36. 15 | 24,8 |
| 30. 30 | 29,5 | 36. 30 | 24,7 |
| 30. 45 | 29,3 | 36. 45 | 24,5 |
| 31. 0 | 29,0 | 37. 0 | 24,3 |
| 31. 15 | 28,8 | 37. 15 | 24,2 |
| 31. 30 | 28,6 | 37. 30 | 24,0 |
| 31. 45 | 28,3 | 37. 45 | 23,8 |
| | | 38. 0 | 23,7 |

## A TABLE of the Depreſſion or Dip of the Horizon of the Sea.

| Elevation of the Eye above the Sea in Feet. | Depreſſion of the Horizon of the Sea. |
|---|---|
| | ′ ″ |
| 1 | 0. 57 |
| 2 | 1. 21 |
| 3 | 1. 39 |
| 4 | 1. 55 |
| 5 | 2. 8 |
| 6 | 2. 20 |
| 7 | 2. 31 |
| 8 | 2. 42 |
| 9 | 2. 52 |
| 10 | 3. 1 |
| 12 | 3. 18 |
| 14 | 3. 34 |
| 16 | 3. 49 |
| 18 | 4. 3 |
| 20 | 4. 16 |
| 22 | 4. 28 |
| 24 | 4. 40 |
| 26 | 4. 52 |
| 28 | 5. 3 |
| 30 | 5. 14 |
| 35 | 5. 39 |
| 40 | 6. 2 |
| 45 | 6. 24 |
| 50 | 6. 44 |
| 60 | 7. 23 |
| 70 | 7. 59 |
| 80 | 8. 32 |
| 90 | 9. 3 |
| 100 | 9. 33 |

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## Right Aſcenſions and Declinations of ſome of the principal fixed Stars.

### Deduced from Dr. Bradley's Obſervations.

| Jan. 1, 1767. Stars Names. | Right Aſcenſions. | Ann. Varia. in AR. | Declination. | Ann. Variation in Declination. | Magnitudes. |
|---|---|---|---|---|---|
| | ° ′ ″ | ″ | ° ′ ″ | ′ | |
| γ Pegaſi —— | 0. 18. 58,4 | 46,20 | 13. 53. 15,3 N | +20,04 | 2 |
| α Arietis —— | 28. 31. 18,4 | 50,06 | 22. 21. 02,5 N | +17,64 | 2 |
| α Ceti —— | 42. 31. 53,1 | 46,93 | 3. 9. 44,1 N | +14,80 | 2 |
| Aldebaran — | 65. 38. 36,6 | 51,41 | 16. 1. 18,1 N | + 8,32 | 1 |
| Capella —— | 74. 52. 41,7 | 66,03 | 45. 43. 39,0 N | + 5,28 | 1 |
| Rigel —— | 75. 50. 13,8 | 43,30 | 8. 29. 15,4 S | — 4,94 | 1 |
| β Tauri —— | 77. 53. 44,6 | 56,80 | 28. 23. 17,7 N | + 4,24 | 2 |
| α Orionis —— | 85. 38. 28,4 | 48,75 | 7. 20. 35,9 N | + 1,56 | 1 |
| Sirius —— | 98. 43. 19,2 | 40,35 | 16. 24. 28,1 S | + 3,10 | 1 |
| Caſtor —— | 109. 55. 32,8 | 58,15 | 32. 22. 36,4 N | — 6,80 | 2 |
| Procyon —— | 111. 46. 33,3 | 48,08 | 5. 48. 32,1 N | — 7,42 | 1 |
| Pollux —— | 112. 45. 37,6 | 56,27 | 28. 34. 9,1 N | — 7,72 | 2 |
| Regulus —— | 148. 59. 12,7 | 48,60 | 13. 5. 49,6 N | —17,17 | 1 |
| Spica Virginis | 198. 14. 15,0 | 47,27 | 9. 56. 17,0 S | +18,97 | 1 |
| Arcturus —— | 211. 15. 49,2 | 42,32 | 20. 24. 31,9 N | —17,16 | 1 |
| Antares —— | 243. 47. 25,3 | 54,92 | 25. 53. 36,3 S | + 8,89 | 1 |
| ε Sagittarii —— | 272. 10. 43,6 | 59,95 | 34. 28. 7,5 S | — 0,72 | 2 |
| α Aquilæ —— | 294. 51. 5,5 | 43,54 | 8. 16. 3,8 N | + 8,40 | 1 |
| 2 α Capricorni | 301. 16. 42,4 | 50,20 | 13. 15. 0,2 S | —10,40 | 3 |
| Fomalhaut — | 341. 10. 55,5 | 50,67 | 30. 51. 1,2 S | —18,97 | 1 |
| α Pegaſi —— | 343. 17. 35,7 | 44,75 | 13. 57. 20,4 N | +19,20 | 2 |

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## Longitudes and Latitudes of ſome of the principal fixed Stars.

### Deduced from Dr. Bradley's Obſervations.

| Jan. 1, 1767. Stars Names. | Longitude. ° ′ ″ | Latitude. ° ′ ″ | Magnitudes. |
|---|---|---|---|
| γ Pegaſi | ♈ 5. 54. 38,5 | 12. 35. 34,5 N | 2 |
| α Arietis | ♉ 4. 24. 20,0 | 9. 57. 30,0 N | 2 |
| α Ceti | ♉ 11. 3. 56,0 | 12. 36. 16,0 S | 2 |
| Aldebaran | ♊ 6. 32. 02,5 | 5. 29. 02,0 S | 1 |
| Rigel | 13. 34. 26,0 | 31. 9. 10,0 S | 1 |
| Capella | 18. 36. 11,0 | 22. 51. 46,0 N | 1 |
| β Tauri | 19. 19. 19,0 | 5. 21. 59,0 N | 2 |
| α Orionis | 25. 30. 05,0 | 16. 3. 31,0 S | 1 |
| Sirius | ♋ 10. 52. 26,0 | 39. 32. 55,0 S | 1 |
| Caſtor | 16. 59. 51,0 | 10. 4. 35,0 N | 2 |
| Pollux | 20. 0. 16,0 | 6. 40. 04,5 N | 2 |
| Procyon | 22. 34. 29,5 | 15. 58. 08,0 S | 1 |
| Regulus | ♌ 26. 35. 31,0 | 0. 27. 27,0 N | 1 |
| Spica Virginis | ♍ 20. 35. 32,0 | 2. 2. 11,0 S | 1 |
| Arcturus | 20. 59. 04,0 | 30. 54. 10,5 N | 1 |
| Antares | ♐ 6. 30. 40,0 | 4. 32. 17,0 S | 1 |
| ε Sagittarii | ♑ 1. 49. 47,0 | 11. 0. 45,0 S | 2 |
| α Aquilæ | 28. 29. 13,0 | 29. 18. 36,0 N | 1 |
| 2 α Capricorni | ♒ 0. 36. 19,0 | 6. 57. 16,0 N | 3 |
| Fomalhaut | ♓ 0. 34. 47,0 | 21. 6. 28,0 S | 1 |
| α Pegaſi | 29. 14. 30,0 | 19. 24. 37,5 N | 2 |

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# NEW TABLES AND RULES FOR CORRECTING THE APPARENT DISTANCE OF THE MOON FROM THE SUN OR A FIXED STAR, ON ACCOUNT OF REFRACTION AND PARALLAX.

BY MR. LYONS.

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# TABLE
## For Refraction, by

| Alt. | 3° | 4° | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | 0318 | 0158 | 0( | | | | | |
| 6 | 0732 | 0419 | 0 | | | | | |
| 7 | 1142 | 0712 | 0 | | | | | |
| 8 | 1541 | 1025 | 0( | | | | | |
| 9 | 1921 | 1339 | 0 | | | | | |
| 10 | 2279 | 1646 | 1 | | | | | |
| 11 | 2614 | 1942 | 1 | | | | | |
| 12 | 2924 | 2227 | 1 | 13° | | | | |
| 13 | 3228 | 2498 | 1 | 00 | 14° | | | |
| 65 | 9019 | 8132 | 7 | 04 | 3537 | 3281 | 30 | 1156 |
| 66 | 9054 | 8166 | 7 | 36 | 3565 | 3312 | 31 | 1173 |
| 67 | 9086 | 8198 | 7 | 64 | 3597 | 3342 | 31 | 1188 |
| 68 | 9117 | 8229 | 7 | 92 | 3625 | 3372 | 31 | 1202 |
| 69 | 9146 | 8258 | 7 | 17 | 3646 | 3396 | 31 | 1216 |
| 70 | 9175 | 8287 | 7 | 42 | 3672 | 3420 | 32 | 1229 |
| 71 | 9201 | 8313 | 7 | 66 | 3695 | 3434 | 32 | 1242 |
| 72 | 9227 | 8338 | 7 | 90 | 3718 | 3448 | 32 | 1254 |
| 73 | 9250 | 8361 | 7 | 11 | 3738 | 3468 | 32 | 1266 |
| 74 | 9273 | 8384 | 7 | 31 | 3758 | 3488 | 32 | 1277 |
| 75 | 9293 | 8405 | 7 | 48 | 3776 | 3529 | 33 | 1286 |
| 76 | 9313 | 8424 | 7 | 65 | 3793 | 3541 | 33 | 1294 |
| 77 | 9331 | 8442 | 7 | 81 | 3809 | 3557 | 33 | 1307 |
| 78 | 9348 | 8459 | 7 | 97 | 3825 | 3572 | 33 | 1319 |
| 79 | 9363 | 8474 | 7 | 11 | 3839 | 3587 | 33 | 1329 |
| 80 | 9378 | 8488 | 7 | 25 | 3852 | 3602 | 33 | 1338 |
| 81 | 9390 | 8501 | 7 | 37 | 3864 | 3613 | 33 | 1348 |
| 82 | 9402 | 8512 | 7 | 48 | 3875 | 3623 | 33 | 1357 |
| 83 | 9411 | 8521 | 7 | 58 | 3885 | 3632 | 34 | 1365 |
| 84 | 9420 | 8530 | 7 | 65 | 3893 | 3639 | 34 | 1372 |
| 85 | 9427 | 8537 | 7 | 72 | 3900 | 3645 | 34 | 1378 |
| 86 | 9433 | 8543 | 7 | 77 | 3905 | 3650 | 34 | 1380 |
| 87 | 9437 | 8548 | 7 | 81 | 3908 | 3653 | 34 | 1382 |
| 88 | 9441 | 8551 | 7 | 83 | 3910 | 3655 | 34 | 1383 |
| 89 | 9443 | 8553 | 7 | 85 | 3912 | 3657 | 34 | 1383 |
| 90 | 9444 | 8554 | 7 | 86 | 3913 | 3658 | 34 | 1383 |

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| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° |
| 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | | | |
| " | " | " | " | " | " | " | " | " | " | " | " | " | " | " | | | |
| 17 | 16 | 16 | 15 | 15 | 14 | 14 | 13 | 12 | 10 | 8 | 6 | 4 | 2 | 0 | | | |
| 17 | 17 | 16 | 16 | 15 | 15 | 14 | 14 | 13 | 10 | 8 | 6 | 4 | 2 | 0 | | | |
| 18 | 17 | 16 | 16 | 15 | 14 | 14 | 13 | 10 | 8 | 6 | 4 | 2 | 0 | | | | |
| 18 | 17 | 17 | 16 | 16 | 15 | 15 | 14 | 11 | 9 | 7 | 4 | 2 | 0 | | | | |
| 18 | 18 | 17 | 17 | 16 | 16 | 15 | 14 | 11 | 9 | 7 | 4 | 2 | 0 | | | | |
| 19 | 18 | 18 | 17 | 16 | 16 | 15 | 15 | 12 | 9 | 7 | 5 | 2 | 0 | | | | |
| 20 | 19 | 19 | 19 | 18 | 17 | 16 | 15 | 12 | 9 | 7 | 5 | 2 | 0 | | | | |
| 21 | 20 | 20 | 19 | 18 | 17 | 16 | 16 | 13 | 10 | 7 | 5 | 2 | 0 | | | | |
| 22 | 21 | 21 | 20 | 19 | 18 | 17 | 17 | 13 | 10 | 7 | 5 | 2 | 0 | | | | |
| 23 | 22 | 22 | 21 | 20 | 19 | 18 | 18 | 14 | 11 | 8 | 5 | 3 | 0 | | | | |
| 24 | 23 | 23 | 22 | 21 | 20 | 19 | 18 | 15 | 11 | 8 | 5 | 3 | 0 | | | | |
| 25 | 24 | 23 | 22 | 21 | 20 | 19 | 19 | 16 | 12 | 9 | 6 | 3 | 0 | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| ° | ° | ° | ° | ° | ° | ° |
| 120 | 115 | 110 | 105 | 100 | 95 | 90 |

Apparent Distance.

Subſtract the Difference of the two Numbers.

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# USE
## OF THE PRECEDING
# TABLES,
## WITH
# RULES
## TO CLEAR THE
# APPARENT DISTANCE
## OF THE
# MOON FROM A STAR,
## OF THE EFFECTS OF
# REFRACTION AND PARALLAX.

### To find the Effect of Refraction.

IN Table I. find what Number anſwers to the two Altitudes of the Moon and Star, the leſſer of the two Altitudes being found at the Top of the Table, the other in the firſt Column on the left Hand.

Prefix the Index 2 to this Number (conſidered as the decimal Part of a Logarithm) and add it to the logarithmic Coſecant of the apparent Diſtance of the Moon and Star; and, abating 10 from the Index of the Sum, find what natural Number anſwers to it in the Table of Logarithms.

From this Number ſubſtract that correſponding to the given Diſtance, and to the leſſer of the two Altitudes in Table II. if the Diſtance is leſs than 90°; or add them together, if the Diſtance exceeds 90°; the Remainder or Sum is the Effect



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of Refraction in Seconds; which added to the observed Distance, gives the Distance cleared of Refraction.

In any of the Cases falling on the right Hand of the black waving Line, or if both Altitudes exceed 50°, the Effect of Refraction may be had at once by Table III.

## To find the Effect of Parallax.

Add together the proportional Logarithm of the Moon's horizontal Parallax, the logarithmic Cosecant of the Star's Altitude corrected for Refraction, and the logarithmic Sine of the Distance cleared from Refraction; the Sum, abating 20 from the Index, will be the proportional Logarithm of a first Arc.

Add together the proportional Logarithm of the Moon's horizontal Parallax, the logarithmic Cosecant of the Moon's Altitude corrected for Refraction, and the Tangent of the Distance cleared from Refraction; the Sum, abating 20 from the Index, will be the proportional Logarithm of a second Arc.

Then, if the Distance is less than 90°, the Difference of these two Arcs is the principal Effect of Parallax (or Parallax in Distance); which added to or subtracted from the Distance corrected for Refraction, according as the first Arc is less or greater than the second, will give the Distance corrected for the principal Effect of Parallax.

But if the Distance exceeds 90°, the Sum of the two Arcs is to be taken instead of their Difference, and is to be subtracted from the Distance corrected for Refraction.

In Table IV. in the Column marked above with the Distance, find the two Numbers answering to the Parallax in Distance and in Altitude, their Difference is the second Correction of Parallax in Seconds; which, added to or subtracted from the Distance corrected for Refraction and principal Effect of Parallax, according as the Distance is less or greater than 90°, will give the correct or reduced Distance.

EXAMPLE

## EXAMPLE I.

| | | | | | |
|---|---|---|---|---|---|
| Let the apparent Altitude of the Star be | ° ′ ″ 24 48. | | The Moon's horizontal Parallax | ′ ″ 56. 15 | |
| Of the Moon's Centre | 12. 30. | | And consequently Parallax in Altitude, by p. 3d of Tables, is | | 55. |
| Observed Distance of the Moon's Centre from the Star | 51. 28. 35 | | | | |

In Table I. the Number answering to 24° and 12° of Altitude is 1411, and to 25 and 12 of Altitude is 1511; therefore 1° Increase of the greater Altitude produces an Increase of 100 in the tabular Number. Say then, by the Rule of Three, If 1° or 60′ give 100, what will 48′ (the Excess of the greater Altitude above 24°) give? the Answer is, 80; which, added to 1411, gives 1491, the Number corrected for exceeding Minutes of greater Altitude. Moreover, 24° and 12° of Altitude giving 1411, as above, and 24 and 13 giving 1232; therefore, 1° Increase of the lesser Altitude gives 179 Decrease of the tabular Number. Say therefore, by the Rule of Three, If 1° or 60′ give 179, what will 30′ (the Excess of the lesser Altitude above 12°) give? the Answer is, 89; which, subtracted from 1491 (the tabular Number corrected for exceeding Minutes of greater Altitude) leaves 1402 for the tabular Number corrected also for the exceeding Minutes of the lesser Altitude;

| | |
|---|---|
| To which prefixing the Index 2, it will be | 2.1402 |
| Log. Cosec. observed Distance 51°. 28′ . . | 10.1066 |
| | 12.2468 |

Rejecting 10 from the Index, we have 2.2468, which is the Logarithm of 176″.

In Table II. under the Column intituled 10° and above, answering to the Distance 51° is 90″, and answering to 52° is 86″; therefore to 51°. 28′ there answers 88″; which subtracted from 176″, leaves the Effect of Refraction 88″.

| | ° ′ ″ |
|---|---|
| Observed Distance . . . . . | 51. 28. 35 |
| Effect of Refraction . . . . . | + 1. 28 |
| Distance cleared of Refraction . . . | 51. 30. 3 |

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## For Parallax.

| | | | | | |
|---|---|---|---|---|---|
| App. Alt. of the Star | ° 24. | ′ 48 | App. Alt. of the Moon | ° 12. | ′ 30 |
| Refraction in Alt. ſubſtr. | | 2 | Refraction in Alt. ſubſtr. | | 4 |
| Alt. corr. for Refraction | 24. | 46 | Alt. corr. for Refraction | 12. | 26 |
| | ° ′ | | | ° ′ | |
| Coſecant | 24. 46 | 10.3778 | Coſecant | 12. 26 | 10.6669 |
| Sine diſt. | 51. 30 | 9.8935 | Tang. diſt. | 51. 30 | 10.0994 |
| Proportional Log. of horizontal Parallax 56′. 15″ | | 0.5051 | Proportional Log. of horizontal Parallax 56′. 15″ | | 0.5051 |
| | | 20.9214 | | | 21.2714 |

Rejecting 20 from theſe Sums,

| | | | |
|---|---|---|---|
| The Arc anſwering to the propor. Log. | 9214 | is | ′ ″<br>30. 7 |
| | 1.2714 | is | 9. 38 |

Their Difference 20. 29 is the principal Effect of Parallax, or Parallax in Diſtance, to be ſubſtracted; becauſe the firſt Arc is greater than the ſecond.

| | ° ′ ″ |
|---|---|
| Diſtance corrected for Refraction . . . . . | 51. 30. 3 |
| Parallax in Diſtance . . . . . | — 20. 29 |
| Diſtance corrected for Refract. and Par. in Diſt. | 51. 9. 34 |

In Table IV. under 51°, and againſt 55′ the Parallax in Altitude is 20″; in the ſame Column againſt 20′ the Parallax in Diſtance is 3″; which ſubſtracted from 20″, leaves 17″, for the ſecond Correction of Parallax, to be added:

| | ° ′ ″ |
|---|---|
| | 51. 9. 34 |
| + | 17 |
| Reduced Diſt. cleared both of Refr. and Par. . | 51. 9. 51 |

N. B. The proportional Parts for the Minutes of the two Altitudes in Table I. may be found alſo by the Rule of Practice, or by Decimal Multiplication, as well as by the Rule of Three. Thus, to find the proportional Part anſwering

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ing to 48′, the Excefs of the greater Altitude above 48°, I find, by the Rule of Practice, if 1°, or 60′, give the Difference 100, 30′ will give 50, 15′ will give 25, and 3′ will give 5; therefore 48′ will give 30 + 15 + 5 = 80, as before. Or, by Decimal Multiplication, conſidering that 48′ is $\frac{8}{10}$ of 60′, I multiply the Difference 100 by $\frac{8}{10}$, which gives the Product 80, as before. The decimal Part any Number of Minutes is of 60′, may be ſeen at one Corner of Table I. againſt the given Number of Minutes found in the Column there marked for Seconds.

## EXAMPLE II.

| | | | |
|---|---|---|---|
| Let apparent Alt. of the Star be | ° ′ ″ 15. 25. | The Moon's horizontal Parallax . . . | ′ ″ 57. 3 |
| Of the Moon's Centre | 27. 30. | Whence the Parallax in Altitude, by p. 3d | 51. |
| Ap. Diſt. of the Star from the Moon's Centre . . | 102. 30. 0 | | |

The Number in Table I. for the Altitudes 27° and 15° is 1176, the Difference for 1° Increaſe of the greater Altitude being + 75, and of the leſſer Altitude — 123; whence the Correction for the Excefs 30′ of the greater Altitude is + 37, and the Correction for the Excefs 25′ of the leſſer Altitude is — 51.

| | |
|---|---|
| Whence the Number from Table I. corrected, is 1176 + 37 — 51 = 1162, or prefixing the Index 2, is . . . . . | 2.1162 |
| Coſecant of Diſt. 102°. 30′ = Coſecant 77°. 30′, the Supplement to 180° . . . . . | 10.0104 |
| | 12.1266 |
| Rejecting 10 from the Index is Log. of . | ″ 134 |
| Number in Table II. to be added, becauſe Diſtance is above 90° . . | + 25 |
| Effect of Refraction . . . . . | 159 = 2′. 39″ |
| | ° ′ ″ |
| Obſerved Diſtance . . . . . | 102. 30. 0 |
| Effect of Refraction . . . . . | + 2. 39 |
| Diſtance cleared of Refraction . . . . . | 102. 32. 39 |

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## For Parallax.

| | | | |
|---|---|---|---|
| Prop. Log. of horiz. Parallax 57′. 3″ | 0.4990 | Propor. Log. of the Moon's hor. Par. 57′. 3″ . . | 0.4990 |
| Cofec. of the Star's app. Alt. 15°. 25′ — Refract. 3′ = 15°. 22′ . . | 10.5768 | Cofec. of the Moon's app. Alt. 27°. 30′ — Refract. 2′ = 27°. 28′ . . | 10.3356 |
| Sine Diſt. cleared of Refrac. 102°. 33′ or 77°. 27′, its Supplem. to 180° | 9.9895 | Tang. Diſt. clear of Refrac. 102°. 33′ or 77°. 27′, its Supplem. to 180° | 10.6524 |
| Prop. Log. of 15′. 32″ or Arc 1ſt | 10.0653 | Prop. Log. of 5′. 52″ or Arc 2d . . | 21.4870 |
| Arc 2d to be added, becauſe Diſt. is above 90° | +5. 52 | | |
| Principal Effect of Par. or Par. in Diſt. | 21. 24 | | |

In Table IV. Parallax in Altitude 51′ gives 5″
Parallax in Diſtance 21 . . 1

Difference . . . . . 4

| | ° ′ ″ |
|---|---|
| Diſtance cleared of Refraction . . . . . | 102. 32. 39 |
| Parallax in Diſtance to be ſubſtracted, becauſe Diſtance is above 90° . . . . . | — 21. 24 |
| | 102. 11. 15 |
| Second Correction of Parallax to be ſubſtracted, becauſe Diſtance is above 90° . . . . . | — 4 |
| Diſtance reduced, or cleared both of Refraction and Parallax . . . . . | 102. 11. 11 |

EXAMPLE

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## EXAMPLE III.

| | | | | | |
|---|---|---|---|---|---|
| Let app. Alt. of the Star be | 48. 20. | | The horizontal Parallax | 0. 55. 29 | |
| Of the Moon | 64. 30. | | Whence the Par. in Altitude | 0. 23. | |
| The observed Dist. | 33. 15. | | The Star's Alt. corrected by Refr. | 48. 19. | |
| Effect of Refract. by Table III. | + 0. 34 | | The Moon's Alt. corr. by Refr. | 64. 30. | |
| Distance cleared of Refraction | 33. 15. 34 | | | | |
| Prop. Log. hor. Par. | 0.5111 | | Prop. Log. hor. Par. | 0.5111 | |
| Cosecant of the Star's Alt. corrected by Refract. 48°. 19′ | 10.1268 | | Cosec. of the Moon's Alt. corrected by Refract. 64°. 30′ | 10.0445 | |
| Sine Dist. 33°. 16′ | 9.7392 | | Tang. Dist. 33°. 16′ | 9.8169 | |
| Prop. Log. Arc first 75′. 32″ | 20.3771 | | | 20.3725 | |
| | | | Prop. Log. Arc 2d | 76. 20 | |
| | | | Arc first | 75. 32 | |
| | | | Par. in Dist. | 0. 48 | |

| | | |
|---|---|---|
| Table IV. Parallax in Altitude | 23 | 7 |
| Parallax in Distance | 1 | 0 |
| Second Correction of Parallax | | 7 |

| | |
|---|---|
| Distance cleared of Refraction | 33. 15. 34 |
| Parallax in Distance | + 0. 48 |
| | 33. 16. 22 |
| Second Correction of Parallax | + 7 |
| Distance reduced | 33. 16. 29 |



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## EXAMPLE IV.

| | | | |
|---|---|---|---|
| Let the app. Alt. of the Star be | ° ′ 53. 13 | The Moon's horizontal Parallax | ′ ″ 61. 9 |
| Of the Moon | 64. 38 | Whence the Moon's Parallax in Altitude | 26. 0 |
| | ° ′ ″ | | |
| The app. Diſtance | 56. 17. 44 | | |
| Table III. | + 1. 1 | | |
| Diſtance cleared of Refraction | 56. 18. 45 | | |
| Propor. Log. of the Moon's horizontal Parallax 61′. 9″ | 0.4689 | Propor. Log. of the Moon's horizontal Parallax 61′. 9″ | 0.4689 |
| Cofecant of the Star's Alt. corrected by Refract. 53°. 12′ | 10.0965 | Cofec. of the Moon's Altitude corrected 64°. 38′ | 10.0440 |
| Sine Diſt. cleared of Refract. 56°. 19′ | 9.9202 | Tang. Diſt. cleared of Refr. 56°. 19′ | 10.1762 |
| Prop. Log. of 58′. 50″ or firſt Arc | 20.4856 | Prop. Log. of 36′. 50″ or ſecond Arc | 20.6891 |
| Second Arc 36. 50 | | | |
| Par. in Diſt. 22. 0 | | | |

Table IV. Parallax in Altitude 26′ gives 4″
Parallax in Diſtance 22 . . 3

Second Correction of Parallax . . . 1

| | |
|---|---|
| | ° ′ ″ |
| Diſtance cleared of Refraction | 56. 18. 45 |
| Parallax in Diſtance | — 22. 0 |
| | 55. 56. 45 |
| Second Correction of Parallax | + 1 |
| Diſtance cleared of Refraction and Parallax | 55. 56. 46 |

REMARKS.

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## REMARKS.

I. In computing the Effect of Refraction, three Places of Figures, beſides the Index, will generally be ſufficient for Table I. but for finding the Effect of Parallax, the Sines &c. ought to be taken to four Places of Figures, beſides the Index.

II. Sherwin's Logarithms are the moſt convenient and exact for theſe and other Calculations; but if a Set of Logarithms be uſed, having no Coſecants, they are eaſily found, by taking the Complement of the logarithmic Sine to 20.0000. Thus, to find the Coſecant of 48°. 19′, ſubſtract its logarithmic Sine 9.8732 from 20.0000, the Remainder 10.1268 is the Coſecant required, as above in Example III.

III. If the Index of the proportional Logarithm of Arc firſt or ſecond for Parallax come out 19, ſo that 20 cannot be thrown off, add 0.3010, or the Logarithm of 2 to the Sum of the Logarithms, and then abating 20 from the Index, find what Number it anſwers to in the Table of proportional Logarithms; which doubled, gives Arc the firſt or ſecond.

IV. If the Moon's Diſtance was taken from the Sun inſtead of a Star, for Star read Sun in the preceding Rules.



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# SUPPLEMENTAL

# TABLES

TO BE USED FOR CORRECTING

## THE II$^{D}$ AND III$^{D}$ TABLES

FOR

# REFRACTION,

AND FOR FINDING THE EFFECT OF THE

## SUN'S PARALLAX,

WHERE IT IS REQUIRED TO HAVE

## THE RESULT TRUE TO A SECOND.

BY MR. LYONS.

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## TABLE I. Supplemental,

Shewing what Number of Seconds is to be subtracted from the Number in Table II. on account of the greater Altitude of the Moon or Star, when under 30°.

| Distance. | Greater Altitude of the Moon or Star. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° 5 | ° 6 | ° 7 | ° 8 | ° 9 | ° 10 | ° 11 | ° 12 | ° 13 | ° 14 | ° 15 | ° 16 | ° 17 |
| ° | // | // | // | // | // | // | // | // | // | // | ′ | ″ | // |
| 10 | 28 | 21 | 16 | 13 | 10 | 8 | 7 | 6 | 5 | 4 | 4 | 3 | 3 |
| 11 | 26 | 19 | 15 | 12 | 9 | 8 | 6 | 5 | 5 | 4 | 4 | 3 | 3 |
| 12 | 23 | 17 | 14 | 11 | 8 | 7 | 6 | 5 | 4 | 3 | 3 | 3 | 3 |
| 13 | 22 | 16 | 13 | 10 | 8 | 6 | 6 | 5 | 4 | 3 | 3 | 3 | 3 |
| 14 | 20 | 14 | 12 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 2 |
| 15 | 19 | 13 | 11 | 9 | 7 | 6 | 5 | 4 | 3 | 3 | 3 | 3 | 2 |
| 16 | 17 | 13 | 10 | 8 | 6 | 5 | 5 | 4 | 3 | 3 | 3 | 3 | 2 |
| 17 | 16 | 12 | 9 | 8 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 2 |
| 18 | 15 | 11 | 9 | 7 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 |
| 19 | 14 | 10 | 8 | 7 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 20 | 14 | 10 | 8 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 21 | 13 | 10 | 8 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 22 | 12 | 9 | 7 | 6 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 23 | 12 | 9 | 7 | 5 | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 1 |
| 24 | 11 | 8 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 |
| 25 | 11 | 8 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 |
| 26 | 10 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 |
| 27 | 10 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 |
| 28 | 9 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 29 | 9 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 30 | 9 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| ° Distance. | | | | | | | | | | | | | |
| 35 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 40 | 6 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| 45 | 5 | 4 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 55 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 120 60 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 110 70 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100 80 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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**Shewing what Number of Seconds is to be subtracted from the Number in Table II. on account of the greater Altitude of the Moon or Star, when under 30°.**

| Distance. | Greater Altitude of the Moon or Star. | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° 18 | ° 19 | ° 20 | ° 21 | ° 22 | ° 23 | ° 24 | ° 25 | ° 26 | ° 27 | ° 28 | ° 29 | ° 30 |
| ° | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| 10 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 11 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 12 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 14 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 16 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 18 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 19 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 55 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Distance. ° | 120 | 110 | 100 | 90

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Shewing what Number of Seconds is to be added to the Number in Table II. ſtanding under 10 Degrees, when the leſſer Altitude is above 10 Degrees.

| Diſtance. | Leſſer Altitude of the Moon or Star. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ° 11 | ° 12 | ° 13 | ° 14 | ° 15 | ° 16 | ° 17 | ° 18 | ° 19 | ° 20 |
| ° | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| 10 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 6 | 6 | 6 |
| 11 | 1 | 2 | 3 | 4 | 4 | 5 | 5 | 5 | 6 | 6 |
| 12 | 1 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 |
| 13 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 5 |
| 14 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 |
| 15 | 1 | 1 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 |
| 16 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 |
| 17 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 |
| 18 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| 19 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| 20 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 21 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| 22 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| 23 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| 24 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 25 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| 26 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| 27 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| 28 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 30 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 35 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 40 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 45 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 55 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 60 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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Shewing what Number of Seconds is to be added to the Number in Table II. ſtanding under 10 Degrees, when the leſſer Altitude is above 10 Degrees.

| Diſtance. | Leſſer Altitude of the Moon or Star. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ° 21 | ° 22 | ° 23 | ° 24 | ° 25 | ° 26 | ° 27 | ° 28 | ° 29 | ° 30 & above |
| ° | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| 10 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 11 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 |
| 12 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 13 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 |
| 14 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 15 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| 16 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 |
| 17 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 18 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 19 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 |
| 20 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 21 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 22 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 23 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 24 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 25 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 26 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 27 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| 28 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 29 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 35 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 40 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| 45 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 50 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 55 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |



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# Table III. Supplemental.

This Table, jointly with the following, is for finding the Correction of Table III.

This Table gives the Number for entering the first upright Column of the following Table.

| Alt. | 50° | 51° | 52° | 53° | 54° | 55° | 56° | 57° | 58° | 59° | 60° | 61° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ° | ″ | ″ | ″ | ′ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | |
| 50 | 0 | | | | | | | | | | | |
| 51 | 0 | 0 | | | | | | | | | | |
| 52 | 0,1 | 0 | 0 | | | | | | | | | |
| 53 | 0,1 | 0,1 | 0 | 0 | | | | | | | | |
| 54 | 0,2 | 0,1 | 0,1 | 0 | 0 | | | | | | | |
| 55 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | | | | | | |
| 56 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | | | | | |
| 57 | 0,5 | 0,4 | 0,4 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | | | | |
| 58 | 0,6 | 0,5 | 0,4 | 0,4 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | | | |
| 59 | 0,8 | 0,6 | 0,5 | 0,4 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | | |
| 60 | 0,9 | 0,7 | 0,6 | 0,5 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | 0 | |
| 61 | 1,0 | 0,9 | 0,7 | 0,6 | 0,4 | 0,3 | 0,2 | 0,2 | 0,2 | 0,1 | 0,1 | 0 |
| 62 | 1,2 | 1,0 | 0,8 | 0,6 | 0,5 | 0,3 | 0,2 | 0,2 | 0,2 | 0,1 | 0,1 | 0 |
| 63 | 1,3 | 1,1 | 0,9 | 0,7 | 0,6 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0,1 |
| 64 | 1,5 | 1,3 | 1,1 | 0,9 | 0,7 | 0,5 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 |
| 65 | 1,6 | 1,4 | 1,2 | 1,0 | 0,8 | 0,6 | 0,5 | 0,4 | 0,3 | 0,2 | 0,1 | 0,1 |
| 66 | 1,8 | 1,6 | 1,4 | 1,1 | 0,9 | 0,7 | 0,6 | 0,5 | 0,3 | 0,2 | 0,1 | 0,1 |
| 67 | 1,9 | 1,7 | 1,5 | 1,2 | 1,0 | 0,8 | 0,7 | 0,6 | 0,4 | 0,3 | 0,2 | 0,2 |
| 68 | 2,1 | 1,9 | 1,6 | 1,4 | 1,1 | 0,9 | 0,8 | 0,7 | 0,5 | 0,4 | 0,3 | 0,2 |
| 69 | 2,2 | 2,0 | 1,7 | 1,5 | 1,2 | 1,0 | 0,9 | 0,7 | 0,6 | 0,4 | 0,3 | 0,3 |
| 70 | 2,4 | 2,1 | 1,8 | 1,6 | 1,3 | 1,1 | 1,0 | 0,8 | 0,7 | 0,5 | 0,4 | 0,3 |
| 71 | 2,5 | 2,2 | 2,0 | 1,7 | 1,5 | 1,2 | 1,1 | 0,9 | 0,8 | 0,6 | 0,5 | 0,4 |
| 72 | 2,7 | 2,4 | 2,1 | 1,9 | 1,6 | 1,3 | 1,1 | 1,0 | 0,8 | 0,7 | 0,5 | 0,4 |
| 73 | 2,8 | 2,5 | 2,2 | 2,0 | 1,7 | 1,4 | 1,2 | 1,1 | 0,9 | 0,8 | 0,6 | 0,5 |
| 74 | 3,0 | 2,7 | 2,4 | 2,1 | 1,8 | 1,5 | 1,3 | 1,1 | 1,0 | 0,8 | 0,6 | 0,5 |
| 75 | 3,1 | 2,8 | 2,5 | 2,2 | 1,9 | 1,6 | 1,4 | 1,2 | 1,1 | 0,9 | 0,7 | 0,6 |
| 76 | 3,2 | 2,9 | 2,6 | 2,3 | 2,0 | 1,7 | 1,5 | 1,3 | 1,2 | 1,0 | 0,8 | 0,7 |
| 77 | 3,3 | 3,0 | 2,7 | 2,4 | 2,1 | 1,8 | 1,6 | 1,4 | 1,2 | 1,0 | 0,8 | 0,7 |
| 78 | 3,4 | 3,1 | 2,8 | 2,4 | 2,1 | 1,8 | 1,6 | 1,4 | 1,3 | 1,1 | 0,9 | 0,8 |
| 79 | 3,5 | 3,2 | 2,9 | 2,5 | 2,2 | 1,9 | 1,7 | 1,5 | 1,3 | 1,1 | 0,9 | 0,8 |
| 80 | 3,6 | 3,3 | 2,9 | 2,6 | 2,3 | 2,0 | 1,8 | 1,6 | 1,4 | 1,2 | 1,0 | 0,8 |
| 81 | 3,7 | 3,4 | 2,9 | 2,6 | 2,3 | 2,0 | 1,8 | 1,6 | 1,4 | 1,2 | 1,0 | 0,9 |
| 82 | 3,8 | 3,5 | 3,0 | 2,7 | 2,4 | 2,1 | 1,9 | 1,6 | 1,4 | 1,3 | 1,1 | 0,9 |
| 83 | 3,9 | 3,5 | 3,1 | 2,7 | 2,4 | 2,1 | 1,9 | 1,6 | 1,4 | 1,3 | 1,1 | 1,0 |
| 84 | 4,0 | 3,6 | 3,2 | 2,8 | 2,5 | 2,2 | 2,0 | 1,7 | 1,5 | 1,4 | 1,2 | 1,0 |
| 85 | 4,0 | 3,6 | 3,2 | 2,8 | 2,5 | 2,2 | 2,0 | 1,8 | 1,5 | 1,4 | 1,2 | 1,0 |
| 90 | 4,1 | 3,7 | 3,3 | 2,9 | 2,6 | 2,3 | 2,1 | 1,9 | 1,6 | 1,4 | 1,2 | 1,1 |

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This Table, jointly with the following, is for finding the Correction of Table III.

This Table gives the Number for entering the first upright Column of the following Table.

| Alt. | 62° | 63° | 64° | 65° | 66° | 67° | 68° | 69° | 70° | 75° | 80° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | | |
| 59 | | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | | |
| 61 | // | | | | | | | | | | | | |
| 62 | 0 | // | | | | | | | | | | | |
| 63 | 0 | 0 | // | | | | | | | | | | |
| 64 | 0 | 0 | 0 | // | | | | | | | | | |
| 65 | 0,1 | 0 | 0 | 0 | // | | | | | | | | |
| 66 | 0,1 | 0 | 0 | 0 | 0 | // | | | | | | | |
| 67 | 0,1 | 0,1 | 0 | 0 | 0 | 0 | // | | | | | | |
| 68 | 0,2 | 0,1 | 0 | 0 | 0 | 0 | 0 | // | | | | | |
| 69 | 0,2 | 0,2 | 0,1 | 0,1 | 0,1 | 0 | 0 | 0 | // | | | | |
| 70 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0,1 | 0 | 0 | 0 | // | | | |
| 71 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0,1 | 0 | 0 | 0 | | // | | |
| 72 | 0,4 | 0,3 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | 0 | 0 | | // | |
| 73 | 0,4 | 0,4 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | 0 | 0 | | | // |
| 74 | 0,5 | 0,4 | 0,3 | 0,3 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | | | |
| 75 | 0,5 | 0,4 | 0,4 | 0,3 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | | | |
| 76 | 0,6 | 0,5 | 0,4 | 0,3 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | 0 | | |
| 77 | 0,6 | 0,5 | 0,4 | 0,3 | 0,3 | 0,2 | 0,2 | 0,1 | 0,1 | 0 | 0 | | |
| 78 | 0,7 | 0,6 | 0,5 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | 0 | | |
| 79 | 0,7 | 0,6 | 0,5 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | 0 | | |
| 80 | 0,7 | 0,6 | 0,5 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | 0 | | |
| 81 | 0,7 | 0,6 | 0,5 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | 0 | 0 | |
| 82 | 0,8 | 0,7 | 0,6 | 0,4 | 0,3 | 0,3 | 0,2 | 0,1 | 0,1 | 0 | 0 | 0 | |
| 83 | 0,8 | 0,7 | 0,6 | 0,5 | 0,4 | 0,4 | 0,3 | 0,2 | 0,2 | 0,1 | 0 | 0 | |
| 84 | 0,8 | 0,7 | 0,6 | 0,5 | 0,4 | 0,4 | 0,3 | 0,2 | 0,2 | 0,1 | 0 | 0 | |
| 85 | 0,8 | 0,7 | 0,6 | 0,5 | 0,4 | 0,4 | 0,3 | 0,2 | 0,2 | 0,1 | 0 | 0 | |
| 90 | 0,9 | 0,8 | 0,7 | 0,6 | 0,5 | 0,5 | 0,4 | 0,3 | 0,2 | 0,1 | 0 | 0 | 0 |



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# TABLE IV. Supplemental,

For finding the Correction to be added to Table III. where both Altitudes are above 50 Degrees.

| N° found by preceding Table | Distance. | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° 10 | ° 11 | ° 12 | ° 13 | ° 14 | ° 15 | ° 16 | ° 17 | ° 18 | ° 19 | ° 20 | ° 21 | ° 22 | ° 23 | ° 24 | ° 25 | ° 26 | ° 27 | ° 28 | ° 29 |
| | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| 0,1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0,2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0,3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0,4 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0,5 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0,6 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0,7 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| 0,8 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 0,9 | 5 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1,0 | 6 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1,1 | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 1,2 | - | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| 1,3 | - | - | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 1,4 | - | - | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| 1,5 | - | - | - | 7 | 6 | 6 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 |
| 1,6 | - | - | - | - | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 |
| 1,7 | - | - | - | - | 7 | 7 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| 1,8 | - | - | - | - | - | 7 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 1,9 | - | - | - | - | - | - | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2,0 | - | - | - | - | - | - | 7 | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 |
| 2,1 | - | - | - | - | - | - | - | 7 | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 4 | 4 |
| 2,2 | - | - | - | - | - | - | - | - | 7 | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 |
| 2,3 | - | - | - | - | - | - | - | - | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 |
| 2,4 | - | - | - | - | - | - | - | - | - | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 |
| 2,5 | - | - | - | - | - | - | - | - | - | - | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 5 | 5 | 5 |
| 2,6 | - | - | - | - | - | - | - | - | - | - | 8 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 5 |
| 2,7 | - | - | - | - | - | - | - | - | - | - | - | 8 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 |
| 2,8 | - | - | - | - | - | - | - | - | - | - | - | - | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 |
| 2,9 | - | - | - | - | - | - | - | - | - | - | - | - | 8 | 7 | 7 | 7 | 7 | 6 | 6 | 6 |
| 3,0 | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | 7 | 7 | 7 | 7 | 6 | 6 |
| 3,1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | 7 | 7 | 7 | 7 | 6 |
| 3,2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | 7 | 7 | 7 | 7 |
| 3,3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 | 7 | 7 | 7 |
| 3,4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 | 7 | 7 |
| 3,5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 | 7 |
| 3,6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 |
| 3,7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3,8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3,9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4,0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4,1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

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# TABLE IV. Supplemental, continued,

For finding the Correction to be added to Table III. where both Altitudes are above 50 Degrees.

| N° found by preceding Table. | Distance. | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° 30 | ° 31 | ° 32 | ° 33 | ° 34 | ° 35 | ° 36 | ° 37 | ° 38 | ° 39 | ° 40 | ° 41 | ° 42 | ° 43 | ° 44 | ° 45 | ° 50 | ° 55 | ° 60 & above |
| // | // | // | // | // | // | // | // | // | // | // | // | // | // | // | // | // | // | // | // |
| 0,1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0,2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0,3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0,4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| 0,5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 0,6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0,7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0,8 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0,9 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1,0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1,1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| 1,2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| 1,3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1,4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1,5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1,6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1,7 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1,8 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| 1,9 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| 2,0 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| 2,1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| 2,2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| 2,3 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2,4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2,5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 |
| 2,6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 |
| 2,7 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 |
| 2,8 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 |
| 2,9 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| 3,0 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 3,1 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | |
| 3,2 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | |
| 3,3 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | |
| 3,4 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | |
| 3,5 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | |
| 3,6 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 5 | | |
| 3,7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | | |
| 3,8 | - | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | | |
| 3,9 | - | - | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | | |
| 4,0 | - | - | - | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | | |
| 4,1 | - | - | - | - | - | - | - | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | | | |

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# TABLE V. Supplemental.

## For the Effect of the Sun's Parallax.

Apparent Distance of the Sun and Moon.

Substract from apparent Distance.

| Alt. ☽ | ° 30 | ° 35 | ° 40 | ° 45 | ° 50 | ° 55 | ° 60 | ° 65 | ° 70 | ° 75 | ° 80 | ° 85 | ° 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ° | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ |
| 5 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 15 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 |
| 20 | 6 | 5 | 5 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 25 | 7 | 6 | 6 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 30 | 9 | 8 | 7 | 6 | 6 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 4 |
| 35 | 10 | 9 | 8 | 7 | 7 | 6 | 6 | 6 | 5 | 5 | 5 | 5 | 5 |
| 40 | 11 | 10 | 9 | 8 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 45 | 12 | 11 | 10 | 9 | 8 | 8 | 7 | 7 | 7 | 6 | 6 | 6 | 6 |
| 50 | 13 | 12 | 10 | 10 | 9 | 8 | 8 | 7 | 7 | 7 | 7 | 7 | 7 |
| 55 | 14 | 13 | 11 | 10 | 9 | 9 | 8 | 8 | 8 | 8 | 7 | 7 | 7 |
| 60 | 15 | 13 | 12 | 11 | 10 | 9 | 9 | 8 | 8 | 8 | 8 | 8 | 8 |
| 65 | 16 | 14 | 12 | 11 | 10 | 10 | 9 | 9 | 8 | 8 | 8 | 8 | 8 |
| 70 | 17 | 15 | 13 | 12 | 11 | 10 | 10 | 9 | 9 | 9 | 9 | 8 | 8 |
| 75 | 17 | 15 | 13 | 12 | 11 | 10 | 10 | 9 | 9 | 9 | 9 | 9 | 8 |
| 80 | 17 | 15 | 13 | 12 | 11 | 11 | 10 | 10 | 9 | 9 | 9 | 9 | 9 |
| 85 | 18 | 16 | 14 | 12 | 11 | 11 | 10 | 10 | 9 | 9 | 9 | 9 | 9 |
| 90 | 18 | 16 | 14 | 12 | 11 | 11 | 10 | 10 | 9 | 9 | 9 | 9 | 9 |
| | | | | | | | ° 120 | ° 115 | ° 110 | ° 105 | ° 100 | ° 95 | ° 90 |

App. Dist. of the Sun and Moon.

Substract from app. Distance.

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# TABLE VI. Supplemental.

For the Effect of the Sun's Parallax.

Apparent Distance of the Sun and Moon.

Add to apparent Distance.

| Alt. ☉ | 0 30 | 0 35 | 0 40 | 0 45 | 0 50 | 0 55 | 0 60 | 0 65 | 0 70 | 0 75 | 0 80 | 0 85 | 0 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ° | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ | ″ |
| 5 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 15 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 20 | 5 | 4 | 4 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 0 |
| 25 | 6 | 5 | 4 | 4 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 0 |
| 30 | 8 | 6 | 5 | 4 | 4 | 3 | 2 | 2 | 2 | 1 | 1 | 0 | 0 |
| 35 | 9 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 |
| 40 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 0 | 0 |
| 45 | 11 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 2 | 2 | 1 | 1 | 0 |
| 50 | 12 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 2 | 1 | 1 | 0 |
| 55 | 13 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 1 | 1 | 0 |
| 60 | 13 | 11 | 9 | 8 | 6 | 5 | 4 | 4 | 3 | 2 | 1 | 1 | 0 |
| 65 | 14 | 11 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 1 | 0 |
| 70 | 14 | 12 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 1 | 0 |
| 75 | 15 | 12 | 10 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 2 | 1 | 0 |
| 80 | 15 | 13 | 10 | 9 | 7 | 6 | 5 | 4 | 3 | 2 | 2 | 1 | 0 |
| 85 | 15 | 13 | 10 | 9 | 7 | 6 | 5 | 4 | 3 | 2 | 2 | 1 | 0 |
| 90 | 15 | 13 | 11 | 9 | 7 | 6 | 5 | 4 | 3 | 2 | 2 | 1 | 0 |
| | | | | | | | 0 120 | 0 115 | 0 110 | 0 105 | 0 100 | 0 95 | 0 90 |

App. Dist. of the Sun and Moon.

Subtract from app. Distance.

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# EXPLICATION

## OF THE USE OF THE

# SUPPLEMENTAL TABLES.

THESE Tables are only neceſſary to be uſed where the utmoſt Accuracy is required; and therefore may very well be omitted in common Practice, ſince the Effect of them will never amount to 10″ (and generally much leſs) if the greater of the two Altitudes of the Moon and Star be 10° or above, as it can ſcarcely ever be leſs. Their Titles almoſt ſufficiently explain their Uſe: nevertheleſs, it may be proper to add the following Directions concerning them.

Tables I. and II. Supplemental, are to be both uſed in correcting Table II. of Refraction. Enter Table I. Supplemental with greater Altitude of the Moon or Star at Top, and Diſtance on the Side, the correſponding Number of Seconds is to be ſubſtracted from that taken out of Table II. of Refraction. Then enter Table II. Supplemental with leſſer Altitude of the Moon or Star at Top, and Diſtance on the Side, the correſponding Number of Seconds added to Number in Table II. of Refraction, firſt already corrected for Table I. Supplemental, gives the Number in Table II. of Refraction corrected, which muſt be applied as before.

Note. That when the utmoſt Accuracy is required, Tables I. and II. of Refraction are to be uſed together with the two firſt ſupplemental Tables, if one or both Altitudes are under 50°, as well in the Caſes falling to the right Hand of the black waving Line as in the reſt of the Table; and Table III. of Refraction is only to be uſed, where both Altitudes are above 50°. In this Caſe, and this Caſe only, Tables III. and IV. Supplemental are to be uſed for correcting Table III. of Refraction. Enter Table III. Supplemental with leſſer Altitude

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titude of the Moon or Star at the Top, and greater Altitude on the Side, and take out the corresponding Number; with which enter Table IV. Supplemental on the Side, and entering the same Table with the Distance on the Top, the corresponding Number of Seconds is the Correction to be added to Table III. of Refraction.

The two last Tables, or V. and VI. Supplemental, serve for correcting the observed Distance of the Moon from the Sun, on account of the Sun's Parallax; their joint Effect cannot exceed 9″. Enter Table V. Supplemental with the Moon's Altitude on the Side, and the Distance at the Top; and enter Table VI. Supplemental with the Sun's Altitude on the Side, and Distance at the Top. The two Numbers so taken out, applied with their proper Signs respectively, according to the Directions indicated by the Tables, to the Distance already corrected by the preceding Tables and Rules, give the Distance further corrected on account of the Sun's Parallax.

Here follow the four Examples wrought before, according to the four principal Tables, corrected by the supplemental Tables.

## Example I. corrected.

The greater Altitude, namely that of the Star, being 24°. 48′, and the Distance 51½°, the Correction of Table II. Supplemental is 0; the lesser Altitude, namely of the Moon, being 12°. 30′, and the Distance 51½°, Table II. Supplemental also gives 0; so that the Number found by Table II. of Refraction, and consequently the Effect of Refraction, as found before, appears to be exact, without needing any further Correction.

Suppose now, that, instead of a Star, it had been the Sun, from which this Distance of the Moon was taken. Entering Table V. Supplemental with the Moon's Altitude 12½° on the Side, and Distance 51½° at the Top, the corresponding Number of Seconds is 2″, to be subtracted. In like Manner entering Table VI. with the Sun's Altitude 24°. 48′ on the Side, and Distance 51½° at Top, the Number of Seconds comes out 3″, to be added. Therefore 51°. 9′. 51″ — 2″ + 3″ = 51°. 9′. 52″, the reduced Distance correct.



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## EXAMPLE II. corrected.

The greater Altitude, namely that of the Moon, being $27\frac{1}{2}°$, and the Diſtance $102\frac{1}{2}°$, Table I. Supplemental gives 0; the leſſer Altitude, namely that of the Star, being 15°. 25′, and the Diſtance as before $102\frac{1}{2}°$; Table II. alſo gives 0; whence the Effect of Refraction found before is exact.

Suppoſe now, that this had been the Moon's Diſtance from the Sun, inſtead of a Star, to correct the Diſtance further for the Effect of the Sun's Parallax, entering Table V. with 28°. 19′, the Moon's Altitude corrected both for Refraction and Parallax, and 102°. 11′, the Diſtance corrected, you find 4″, to be ſubſtracted. Entering Table VI. Supplemental with the Sun's Altitude 15°. 22′, and Diſtance 102°. 11′, you find 0″; whence 102°. 11′. 11″ — 4″ = 102°. 11′. 7″, the Diſtance of the Moon from the Sun reduced or finally corrected.

## EXAMPLE III. corrected.

One of the Altitudes, namely that of the Moon being under 50°. This Caſe, though falling to the right-hand Side of the black waving Line, muſt not be computed by Table III. but by Tables I. and II. of Refraction, corrected by Tables I. and II. Supplemental; becauſe the utmoſt Accuracy is ſuppoſed to be required.

| | |
|---|---|
| Table I. gives 0641 + 2 — 6 = 0637, to which prefix the Index 2, it is . . . . . | 2.0637 |
| Coſecant Diſtance 33°15′ . . . . . | 10.2610 |
| Logarithm of 211 . . . . . | 12.3247 |

The Number in Table II. in the Column intituled 10° and above, to Diſtance 33° being 174″, and to Diſtance 34°, being 167″, to 33°. 14′, there will anſwer 172″; but this muſt be corrected by Tables I. and II. Supplemental.

The greater Altitude being above 30°, Table I. Supplemental gives 0; the leſſer Altitude being above 30°, and the Diſtance being 33°, Table II. gives 2″, to be added to 172″, makes 174″, to be ſubſtracted from 211″, the Remainder 37″ is the Effect of Refraction to be added to the obſerved Diſtance 33°. 15′. 0″ gives the Diſtance cleared of Refraction 33°. 15′. 37″, or 3″ greater than found before by the applying Table III. only. The Calculation of the Effect of Parallax

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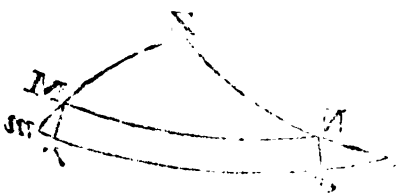
Parallax will not be altered hereby, ſo that the reduced Diſtance will come out 3″ greater than before, or 33°. 16′. 32″.

Suppoſe now the Diſtance was that of the Moon from the Sun, and not from a Star, to find the Effect of the Sun's Parallax, the Moon's Altitude corrected for Refraction and Parallax being 64°. 53′, and the Diſtance above corrected 33°. 16′, Table V. Supplemental gives 15″, to be ſubſtracted; and the Sun's Altitude corrected being 48°. 19′, Table VI. Supplemental gives 10″, to be added. Therefore 33°. 16′. 32″ — 15″ + 10″ = 33°. 16′. 27″, the reduced or correct Diſtance of the Moon from the Sun.

## EXAMPLE IV. corrected.

Table III. Supplemental anſwering to the Altitude 65° and 53°, gives 1″,0; with which entering Table IV. Supplemental on the Side, and with the Diſtance 56° at the Top, there will be found 1″, to be added to 61″, the Number found by Table III. or it will come to the ſame thing, if it be added to the Diſtance above cleared of Refraction and Parallax, viz. 55°. 56′. 46″; whence the Diſtance further corrected will be 55°. 56′. 47″.





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# INVESTIGATION

OF THE

# TABLES

AND

# RULES

FOR FINDING THE EFFECT OF

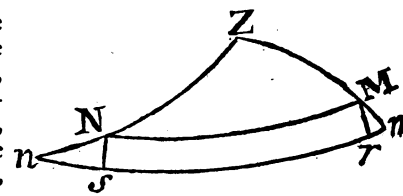
# REFRACTION

AND

# PARALLAX

UPON THE

## MOON's DISTANCE FROM A STAR.




LET Z be the Zenith, M the Moon, its Alt. $= \mu$, N the Star, its Altitude $= \nu$, Sine $\mu = M$, Cosine $\mu = m$, Sine $\nu = N$, Cosine $\nu = n$, Distance M N $= \Delta$, its Sine $= D$, and Cosine $= d$, Radius $= 1$. Putting $\dot{\mu}$ to express the Refraction in Altitude M $m$ at the Altitude $\mu$, and $\dot{\nu}$ the Refraction in Altitude N $n$ at the Altitude $\nu$, and drawing the Arches N $s$, M $r$ perpendicular to the true Distance $mn$, the Distance is contracted by Refraction, by the Quantity

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Quantity $ns + mr = Nn \times \text{Cof. } n + Mm \times \text{Cof. } m = \nu \times \frac{M - dN}{Dn} + \mu \times \frac{N - dM}{Dm} = \frac{1}{D} \times \frac{M\nu}{n} + \frac{N\mu}{m} - \frac{d}{D} \times \frac{N\nu}{n} + \frac{M\mu}{m}$.

The Logarithms of $\frac{M\nu}{n} + \frac{N\mu}{m}$ are contained in Table I. to which the logarithmic Cofecant of the Diſtance, or the Logarithm of $\frac{1}{D}$ being added, the Sum is the Logarithm of the Quantity $\frac{1}{D} \times \frac{M\nu}{n} + \frac{N\mu}{m}$, or the firſt Part of the Formula above.

As the greater of the two Altitudes (ſuppoſe $\mu$) can ſcarcely be leſs than 10°, $\frac{M\mu}{m}$ may be conſidered as a conſtant Quantity $= 57''$, the Refraction at the Altitude of 45°, which put $= e$; for, according to Dr. Bradley's Rule, $\mu = 57'' \times \text{Cotang. } \mu + 3\mu = 57'' \times \frac{m}{M}$ nearly, when $\mu$ is 10° or more, and conſequently $\frac{M\mu}{m} = 57'' = e$, whence the ſecond Part of the Formula $\frac{d}{D} \times \frac{N\nu}{n} + \frac{M\mu}{m} = \frac{d}{D} \times \frac{N\nu}{n} + e$ very nearly, $\nu$ being taken as the leſſer Altitude, the Values of which Expreſſion are contained in Table II.

Supposing the Refraction in Altitude to be accurately as the Tangents of the Zenith Diſtances, as they are very nearly for Altitudes above 10°, $\mu = \frac{em}{M}$ and $\nu = \frac{en}{N}$, which ſubſtituted in the general Formula, it becomes $\frac{1}{D} \times \frac{eM}{N} + \frac{eN}{M} - \frac{d}{D} \times 2e$, and ſubſtituting for the Cotang. $\frac{d}{D}$ it is equal $\frac{1}{D} - t$, $t$ being the Tangent of Half the Diſtance, or $\frac{1}{2}\delta$, the general Formula is reduced to the following Expreſſion, $\frac{e}{D} \times \frac{M}{N} + \frac{N}{M} - 2 + 2et + \frac{e}{D} \times \frac{(M-N)^2}{MN}$.

If

If both Altitudes are above 50°, the Quantity $\frac{e}{D} \times \frac{\overline{M-N}^2}{MN}$ will never exceed 8″; and therefore the Effect of Refraction may be taken $= 2ee$, the Values of which are contained in Table III.

The Caſe is the ſame with reſpect to all the Places falling to the right Hand of the black waving Line in Table I. which therefore will alſo be found at once by Table III.

When the utmoſt Accuracy is required, ſome ſmall Corrections muſt be made to Tables I, II, and III. of Refraction, theſe are contained in the four firſt ſupplemental Tables, and are readily to be taken out at Sight. The Foundation of them is as follows: $\mu$ being $= e \times$ Cotang. $\mu + 3\mu = e \times \frac{m}{M} - \frac{3\mu}{M^2}$, nearly $=$ (or for $\mu$ ſubſtituting its approximate Value $\frac{em}{M}$ $=$) $e \times \frac{m}{M} - \frac{3em}{M^3}$, it is plain that $\frac{M\mu}{m} = e - \frac{3e^2}{M^2}$. In like Manner $\frac{N\nu}{n} = e - \frac{3e^2}{N^2}$. Whence $\frac{d}{D} \times \frac{N\nu}{n} + \frac{M\mu}{m}$, the ſecond Part of the general Formula, may be taken for Altitudes above 10°, very accurately, to be $= \frac{d}{D} \times 2e - \frac{3e^2}{M^2} - \frac{3e^2}{N^2}$. But the Numbers in Table II. ſtanding in the laſt Column, intituled 10° and above, are $= \frac{d}{D} \times 112'',5$, and the Expreſſion juſt found above is $= \frac{d}{D} \times 112'' - \frac{3e^2}{M^2} - \frac{3e^2}{N^2}$, which is greater than $\frac{d}{D} \times 112'',5$ by $\frac{d}{D} \times 1''\frac{1}{2} - \frac{3e^2}{M^2} - \frac{3e^2}{N^2}$. This Correction, therefore, muſt be applied to the Number taken out of the laſt Column of Table II. This may be reſolved into two Parts, $\frac{d}{D} \times 1''\frac{1}{2} - \frac{3e^2}{N^2}$ and $-\frac{d}{D} \times \frac{3e^2}{M^2}$.

The firſt Part is contained in the ſecond ſupplemental Table, the other Part in the firſt ſupplemental Table. Only when the greater Altitude is under 10°, the Correction $-\frac{d}{D} \times \frac{3e^2}{M^2}$ being not quite exact, the Correction in that

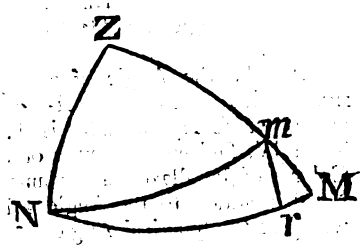
Caſe

Caſe was found from the Formula $-\frac{d}{D} \times \overline{57'' - \frac{M\mu}{m}}$; for it is plain that this Quantity added to $\frac{d}{D} \times \overline{\frac{N\nu}{n} + 57''}$, the Quantity ſtanding in the laſt Column of Table II. makes $\frac{d}{D} \times \frac{N\nu}{n} + \frac{M\mu}{m}$ the ſecond Part of the general Formula.

It has been ſhewn above, that when both Altitudes are conſiderable the Effect of Refraction $= 2et + \frac{e}{D} \times \overline{\frac{M-N}{MN}}^2$, the principal Part $2et$ being contained in Table III. the other Part ſerves as a Correction to it; the third ſupplemental Table contains the Values of $e \times \overline{\frac{M-N}{MN}}^2$, and the fourth ſupplemental Table ſerves to multiply this laſt Quantity by $\frac{1}{D}$, or the Coſecant of the Diſtance, in order to obtain the required Correction of Table III. of Refraction.

## Inveſtigation of the two Rules for finding the Effect of PARALLAX.

Let $h$ = horizontal Parallax; then $Mm = hm$, and $Mr = Mm \times$ Cof. M $= hm \times \frac{N - d\,M}{Dm} = \frac{Nh}{D} - \frac{h\,d\,M}{D}$ = horizontal Parallax × Sine of the Star's Altitude × Coſec. Diſt. — horizontal Parallax × Sine of the Moon's Alt. × Cotang. Diſtance.




The Effect of the Sun's Parallax might be found in the ſame Manner; but being very ſmall, is conveniently thrown into two ſhort Tables, the Vth and VIth ſupplemental ones.

Table IV. for Parallax contains the Product of the Verſe-ſines of the Number of Minutes contained in the firſt Column, and the Cotangent of the Numbers at the Top of the Table, reduced into Seconds.

The

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The Difference of the two Numbers taken out of this Table expreſſes the Quantity of the ſecond Correction of Parallax, delivered in the Preface to the Britiſh Mariner's Guide; for the Inveſtigation of which, ſee Philoſophical Tranſactions, Vol. LIV. p. 273, for the Year 1764.

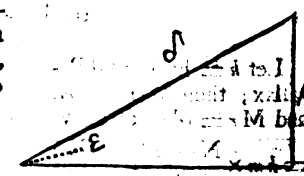
N. B. Table IV. will be found uſeful, as a general Table, for many other Purpoſes, where the Fluxions of ſpherical Triangles are concerned; of which take one

## EXAMPLE.

Let it be required to find the Deviation of a Star's Parallel of Declination from the fixed horizontal Wire of a Quadrant placed in the Meridian, at any ſmall given Diſtance of the Star from the Meridian. Enter the Table with the Star's Diſtance from the neareſt Pole of the Equator at Top, and the given Diſtance from the Meridian, expreſſed in Minutes of a great Circle on the Side (in the Column marked Parallaxes) and you will find the Deviation required. Suppoſe the Diſtance of the Star from the Pole to be 10°, and the Diſtance from the Meridian to be 30′ of an Arch of a great Circle, the Deviation will be found 45″.

## PROBLEM.

Having given the Hypothenuſe $\delta$, and one Leg $\beta$, of a right-angled ſpherical Triangle, to find the Angle oppoſite to this Leg.




Let $\varepsilon$ be the Angle of a right-angled rectilinear Triangle, whoſe Hypothenuſe is $\delta$, and one Side $\beta$, and in Table IV. find what Number of Seconds anſwers to $\beta$ in the Column of Parallaxes, and $\varepsilon$ among the Diſtances; $\frac{1}{3}$ of this Number added to the Angle $\varepsilon$ in the rectilinear Triangle, will give the ſpherical Angle.

## EXAMPLE.

Let $\beta = 1°$, $\delta = 2°$, and therefore $\varepsilon = 30°$; the Number in Table IV. anſwering to 60′ and 30° is 54″, $\frac{1}{3}$ of which is 18″; whence the ſpherical Angle $= 30°.\ 0'.\ 18''$.

[This was communicated by Mr. LYONS.]

CORRECTION

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# CORRECTION

## TO BE APPLIED TO THE

# EFFECT OF REFRACTION

Found by the above or any other Method,

## On account of the Barometer and Thermometer.

THE Refractions in Altitude, and consequently the Effect of Refraction upon the Moon's Diſtance from a Star, varying with the Changes of the Temperature of the Air, indicated by the Barometer and Thermometer, it becomes neceſſary to pay a Regard to this Circumſtance, when the utmoſt Accuracy is required, and therefore as often as the ſupplemental Tables are made uſe of.

The Table of Refractions in Altitude, p. 2. was adapted by Dr. Bradley to the Altitude 50° of Fahrenheit's Thermometer, and the Altitude 29,6 Inches of the Barometer; and it will anſwer equally to the Altitude 55 of the Thermometer, and 30 Inches of the Barometer, which is about its mean Altitude at the Level of the Sea.

When they are at any other Heights, to find what Correction muſt be made to the Effect of Refraction, already found by Tables I. and II. or Table III. with the ſupplemental Tables; ſay, As 400 is to the Difference of the Thermometer from 55°; ſo is the Effect of Refraction, before found, to its Correction required; to be ſubſtracted from thence, if the Thermometer is higher than 55°; but to be added, if the Thermometer is lower.

Take the Difference between the Altitude of the Barometer and 30 Inches, and ſay, As 300 is to the ſaid Difference, expreſſed in Tenths of an Inch; ſo is the Effect of Refraction corrected for the Thermometer, to the Correction required on account of the Barometer; which added to or ſubſtracted from the Effect of Refraction corrected for the Thermometer, ac-



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cording as the Barometer is higher or lower than 30 Inches, gives the true Effect of Refraction corrected on account of both.

The common Barometer not being proper to be uſed at Sea, and the Changes of Refraction relative to this Inſtrument being generally much leſs than thoſe anſwering to the Changes of the Thermometer, eſpecially near and between the Tropics, perhaps the Correction of the Effect of Refraction on account of the Barometer will generally be omitted, except the Inſtrument called the Marine Barometer ſhall be found, or be improved, to be of ſufficient Exactneſs for Uſe at Sea.

The Thermometer made uſe of ſhould be of Fahrenheit's Scale; and if not kept always in a ſhady Place in the open Air, ſhould be brought out when wanted, and kept in the Air for at leaſt five Minutes, when it will come to its proper Station, anſwerable to the Temperature of the Air.

The Refraction in Altitude taken out of the Table, p. 2. may, in like Manner as above, be corrected on account of the Barometer and Thermometer; but this will be of no great Conſequence for correcting Altitudes taken from the Horizon of the Sea, as they can ſeldom be taken ſo exact as the Diſtance of the Moon from the Sun or Stars may; and the Exactneſs of a Minute is more than ſufficient for all the Purpoſes to which the Altitudes taken at Sea are at preſent applied in the Practice of Navigation. But ſhould an Obſerver take Altitudes of the Sun or Stars at Land, for finding his Latitude or the Time of the Day, with a well-divided aſtronomical Quadrant, or with a good Hadley's Quadrant, by the Help of Reflexion from a Baſon of Water or Quickſilver, defended from the Wind, in ſuch Caſe it might be proper that he ſhould firſt correct the Refractions taken out of Table p. 2. in the Manner above explained, before he applies them to the Reduction of his Obſervations.

I cannot conclude this Subject without firſt paying a Tribute of Juſtice due to the Memories of thoſe great Aſtronomers, Dr. Halley and Dr. Bradley, in the following Remark; that as to the former, we owe the Hint of the Uſe that may be made of the Barometer and Thermometer in correcting aſtronomical Refractions; ſo to the latter we owe the firſt Example of putting this Method in Practice, together with a more accurate Table of mean Refractions than was known before (ſee p. 2.) and a moſt excellent Rule expreſſing the Changes of the ſame Refractions, anſwering to the Variations of the Thermometer (the Subſtance of which is given above) deduced from the Mean of a great many Obſervations, made with an Inſtrument far ſuperior to any before uſed in the Practice of Aſtronomy.

A NEW

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# A NEW METHOD OF COMPUTING THE EFFECT OF REFRACTION AND PARALLAX UPON THE MOON'S DISTANCE FROM THE SUN OR A FIXED STAR.

BY MR. DUNTHORNE.

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A TABLE for reducing the apparent to the true Altitude of the Moon. I.

| Hor. Par. ☽ | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 |
|---|---|---|---|---|---|
| Alt. ☽ | Corn. + | Corn. + | Corn. + | Corn. + | Corn. + |
| ° | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ |
| 0 | 20. 0 | 21. 0 | 22. 0 | 23. 0 | 24. 0 |
| 1 | 28. 31 | 29. 31 | 30. 31 | 31. 31 | 32. 31 |
| 2 | 34. 23 | 35. 23 | 36. 23 | 37. 23 | 38. 23 |
| 3 | 38. 20 | 39. 20 | 40. 20 | 41. 20 | 42. 20 |
| 4 | 41. 1 | 42. 1 | 43. 1 | 44. 1 | 45. 1 |
| 5 | 42. 54 | 43. 53 | 44. 53 | 45. 53 | 46. 53 |
| 6 | 44. 15 | 45. 14 | 46. 14 | 47. 14 | 48. 13 |
| 7 | 45. 16 | 46. 15 | 47. 15 | 48. 14 | 49. 14 |
| 8 | 46. 0 | 46. 59 | 47. 58 | 48. 58 | 49. 57 |
| 9 | 46. 32 | 47. 32 | 48. 31 | 49. 30 | 50. 29 |
| 10 | 46. 57 | 47. 56 | 48. 55 | 49. 54 | 50. 53 |
| 11 | 47. 15 | 48. 14 | 49. 13 | 50. 12 | 51. 11 |
| 12 | 47. 27 | 48. 26 | 49. 25 | 50. 23 | 51. 22 |
| 13 | 47. 35 | 48. 34 | 49. 32 | 50. 31 | 51. 29 |
| 14 | 47. 40 | 48. 38 | 49. 36 | 50. 35 | 51. 33 |
| 15 | 47. 42 | 48. 40 | 49. 38 | 50. 36 | 51. 34 |
| 16 | 47. 40 | 48. 38 | 49. 35 | 50. 33 | 51. 31 |
| 17 | 47. 36 | 48. 34 | 49. 31 | 50. 29 | 51. 26 |
| 18 | 47. 31 | 48. 28 | 49. 25 | 50. 22 | 51. 19 |
| 19 | 47. 23 | 48. 20 | 49. 16 | 50. 13 | 51. 10 |
| 20 | 47. 13 | 48. 9 | 49. 6 | 50. 2 | 50. 59 |
| 21 | 47. 2 | 47. 58 | 48. 54 | 49. 50 | 50. 46 |
| 22 | 46. 48 | 47. 44 | 48. 39 | 49. 35 | 50. 31 |
| 23 | 46. 33 | 47. 29 | 48. 24 | 49. 19 | 50. 14 |
| 24 | 46. 18 | 47. 12 | 48. 7 | 49. 2 | 49. 57 |
| 25 | 46. 0 | 46. 55 | 47. 49 | 48. 44 | 49. 38 |
| 26 | 45. 42 | 46. 36 | 47. 30 | 48. 24 | 49. 18 |
| 27 | 45. 22 | 46. 16 | 47. 9 | 48. 3 | 48. 56 |
| 28 | 45. 1 | 45. 54 | 46. 47 | 47. 40 | 48. 33 |
| 29 | 44. 39 | 45. 31 | 46. 24 | 47. 16 | 48. 9 |
| 30 | 44. 15 | 45. 7 | 45. 59 | 46. 51 | 47. 43 |

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A TABLE for reducing the apparent to the true Altitude of the Moon. I. continued.

| Hor. Par. ☽ | ′ 58 | ′ 59 | ′ 60 | ′ 61 | ′ 62 |
|---|---|---|---|---|---|
| Alt. ☽ | Corn. + | Corn. + | Corn. + | Corn. + | Corn. + |
| ° | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ |
| 0 | 25. 0 | 26. 0 | 27. 0 | 28. 0 | 29. 0 |
| 1 | 33. 31 | 34. 31 | 35. 31 | 36. 31 | 37. 31 |
| 2 | 39. 23 | 40. 23 | 41. 23 | 42. 23 | 43. 23 |
| 3 | 43. 20 | 44. 20 | 45. 19 | 46. 19 | 47. 19 |
| 4 | 46. 0 | 47. 0 | 48. 0 | 49. 0 | 50. 0 |
| 5 | 47. 52 | 48. 52 | 49. 52 | 50. 52 | 51. 52 |
| 6 | 49. 13 | 50. 13 | 51. 12 | 52. 12 | 53. 12 |
| 7 | 50. 14 | 51. 13 | 52. 13 | 53. 12 | 54. 12 |
| 8 | 50. 57 | 51. 56 | 52. 56 | 53. 55 | 54. 54 |
| 9 | 51. 29 | 52. 28 | 53. 27 | 54. 26 | 55. 26 |
| 10 | 51. 52 | 52. 51 | 53. 50 | 54. 50 | 55. 49 |
| 11 | 52. 9 | 53. 8 | 54. 7 | 55. 6 | 56. 5 |
| 12 | 52. 21 | 53. 19 | 54. 18 | 55. 17 | 56. 16 |
| 13 | 52. 28 | 53. 26 | 54. 25 | 55. 23 | 56. 22 |
| 14 | 52. 31 | 53. 29 | 54. 28 | 55. 26 | 56. 24 |
| 15 | 52. 31 | 53. 29 | 54. 27 | 55. 25 | 56. 23 |
| 16 | 52. 28 | 53. 26 | 54. 24 | 55. 21 | 56. 19 |
| 17 | 52. 23 | 53. 21 | 54. 18 | 55. 16 | 56. 13 |
| 18 | 52. 16 | 53. 13 | 54. 10 | 55. 7 | 56. 4 |
| 19 | 52. 6 | 53. 3 | 54. 0 | 54. 57 | 55. 53 |
| 20 | 51. 55 | 52. 51 | 53. 48 | 54. 44 | 55. 40 |
| 21 | 51. 42 | 52. 38 | 53. 34 | 54. 30 | 55. 26 |
| 22 | 51. 26 | 52. 22 | 53. 18 | 54. 13 | 55. 9 |
| 23 | 51. 10 | 52. 5 | 53. 0 | 53. 55 | 54. 51 |
| 24 | 50. 52 | 51. 47 | 52. 41 | 53. 36 | 54. 31 |
| 25 | 50. 32 | 51. 27 | 52. 21 | 53. 15 | 54. 10 |
| 26 | 50. 12 | 51. 5 | 51. 59 | 52. 53 | 53. 47 |
| 27 | 49. 49 | 50. 43 | 51. 36 | 52. 30 | 53. 23 |
| 28 | 49. 26 | 50. 19 | 51. 12 | 52. 5 | 52. 58 |
| 29 | 49. 1 | 49. 54 | 50. 46 | 51. 39 | 52. 31 |
| 30 | 48. 35 | 49. 27 | 50. 19 | 51. 11 | 52. 3 |

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A TABLE for reducing the apparent to the true Altitude of the Moon. I. continued.

| Hor. Par. ☽ | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 |
|---|---|---|---|---|---|
| Alt. ☽ | Corn. + | Corn. + | Corn. + | Corn. + | Corn. + |
| ° | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ |
| 30 | 44. 15 | 45. 7 | 45. 59 | 46. 51 | 47. 43 |
| 31 | 43. 51 | 44. 43 | 45. 34 | 46. 25 | 47. 17 |
| 32 | 43. 26 | 44. 16 | 45. 7 | 45. 58 | 46. 49 |
| 33 | 42. 59 | 43. 50 | 44. 40 | 45. 30 | 46. 21 |
| 34 | 42. 32 | 43. 22 | 44. 11 | 45. 1 | 45. 51 |
| 35 | 42. 3 | 42. 53 | 43. 42 | 44. 31 | 45. 20 |
| 36 | 41. 34 | 42. 23 | 43. 12 | 44. 0 | 44. 48 |
| 37 | 41. 4 | 41. 52 | 42. 40 | 43. 28 | 44. 16 |
| 38 | 40. 33 | 41. 20 | 42. 7 | 42. 55 | 43. 42 |
| 39 | 40. 1 | 40. 47 | 41. 34 | 42. 21 | 43. 7 |
| 40 | 39. 28 | 40. 14 | 41. 0 | 41. 46 | 42. 32 |
| 41 | 38. 54 | 39. 40 | 40. 25 | 41. 10 | 41. 56 |
| 42 | 38. 20 | 39. 4 | 39. 49 | 40. 34 | 41. 18 |
| 43 | 37. 44 | 38. 28 | 39. 12 | 39. 56 | 40. 40 |
| 44 | 37. 8 | 37. 52 | 38. 35 | 39. 18 | 40. 1 |
| 45 | 36. 32 | 37. 14 | 37. 56 | 38. 39 | 39. 21 |
| 46 | 35. 54 | 36. 35 | 37. 17. | 37. 59 | 38. 41 |
| 47 | 35. 16 | 35. 56 | 36. 37. | 37. 18 | 37. 59 |
| 48 | 34. 37 | 35. 17 | 35. 57. | 36. 37 | 37. 17 |
| 49 | 33. 57 | 34. 36 | 35. 16. | 35. 55 | 36. 34 |
| 50 | 33. 16 | 33. 55 | 34. 34. | 35. 12 | 35. 51 |
| 51 | 32. 35 | 33. 13 | 33. 51 | 34. 29 | 35. 6 |
| 52 | 31. 54 | 32. 30 | 33. 7 | 33. 44 | 34. 21 |
| 53 | 31. 11 | 31. 47 | 32. 23 | 32. 59 | 33. 36 |
| 54 | 30. 28 | 31. 3 | 31. 39 | 32. 14 | 32. 49 |
| 55 | 29. 44 | 30. 19 | 30. 53 | 31. 28 | 32. 2 |
| 56 | 29. 0 | 29. 33 | 30. 7 | 30. 41 | 31. 14 |
| 57 | 28. 15 | 28. 48 | 29. 20 | 29. 53 | 30. 26 |
| 58 | 27. 30 | 28. 1 | 28. 33 | 29. 5 | 29. 37 |
| 59 | 26. 44 | 27. 14 | 27. 45 | 28. 16 | 28. 47 |
| 60 | 25. 57 | 26. 27 | 26. 57 | 27. 27 | 27. 57 |

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A TABLE for reducing the apparent to the true Altitude of the Moon. I. continued.

| Hor. Par. ☽ | ′ 58 | ′ 59 | ′ 60 | ′ 61 | ′ 62 |
|---|---|---|---|---|---|
| Alt. ☽ | Corn. + | Corn. + | Corn. + | Corn. + | Corn. + |
| ° | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ |
| 30 | 48. 35 | 49. 27 | 50. 19 | 51. 11 | 52. 3 |
| 31 | 48. 8 | 49. 0 | 49. 51 | 50. 43 | 51. 34 |
| 32 | 47. 40 | 48. 31 | 49. 22 | 50. 13 | 51. 4 |
| 33 | 47. 11 | 48. 1 | 48. 52 | 49. 42 | 50. 32 |
| 34 | 46. 41 | 47. 30 | 48. 20 | 49. 10 | 50. 0 |
| 35 | 46. 9 | 46. 58 | 47. 47 | 48. 37 | 49. 26 |
| 36 | 45. 37 | 46. 25 | 47. 14 | 48. 2 | 48. 51 |
| 37 | 45. 3 | 45. 51 | 46. 39 | 47. 27 | 48. 15 |
| 38 | 44. 29 | 45. 16 | 46. 4 | 46. 51 | 47. 39 |
| 39 | 43. 54 | 44. 41 | 45. 27 | 46. 14 | 47. 1 |
| 40 | 43. 18 | 44. 4 | 44. 50 | 45. 36 | 46. 22 |
| 41 | 42. 41 | 43. 26 | 44. 11 | 44. 57 | 45. 42 |
| 42 | 42. 3 | 42. 47 | 43. 32 | 44. 17 | 45. 1 |
| 43 | 41. 24 | 42. 8 | 42. 52 | 43. 36 | 44. 19 |
| 44 | 40. 44 | 41. 27 | 42. 11 | 42. 54 | 43. 37 |
| 45 | 40. 4 | 40. 46 | 41. 29 | 42. 11 | 42. 53 |
| 46 | 39. 22 | 40. 4 | 40. 46 | 41. 27 | 42. 9 |
| 47 | 38. 40 | 39. 21 | 40. 2 | 40. 43 | 41. 24 |
| 48 | 37. 57 | 38. 37 | 39. 18 | 39. 58 | 40. 38 |
| 49 | 37. 14 | 37. 53 | 38. 32 | 39. 12 | 39. 51 |
| 50 | 36. 29 | 37. 8 | 37. 46 | 38. 25 | 39. 3 |
| 51 | 35. 44 | 36. 22 | 37. 0 | 37. 37 | 38. 15 |
| 52 | 34. 58 | 35. 35 | 36. 12 | 36. 49 | 37. 26 |
| 53 | 34. 12 | 34. 48 | 35. 24 | 36. 0 | 36. 36 |
| 54 | 33. 24 | 34. 0 | 34. 35 | 35. 10 | 35. 45 |
| 55 | 32. 36 | 33. 11 | 33. 45 | 34. 20 | 34. 54 |
| 56 | 31. 48 | 32. 21 | 32. 55 | 33. 28 | 34. 2 |
| 57 | 30. 58 | 31. 31 | 32. 4 | 32. 36 | 33. 9 |
| 58 | 30. 9 | 30. 40 | 31. 12 | 31. 44 | 32. 16 |
| 59 | 29. 18 | 29. 49 | 30. 20 | 30. 51 | 31. 22 |
| 60 | 28. 27 | 28. 57 | 29. 27 | 29. 57 | 30. 27 |

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A TABLE for reducing the apparent to the true Altitude of the Moon. I. continued.

| Hor. Par. ☽ | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 |
|---|---|---|---|---|---|
| Alt. ☽ | Corn. + | Corn. + | Corn. + | Corn. + | Corn. + |
| ° | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ |
| 60 | 25. 57 | 26. 27 | 26. 57 | 27. 27 | 27. 57 |
| 61 | 25. 10 | 25. 39 | 26. 8 | 26. 37 | 27. 6 |
| 62 | 24. 22 | 24. 51 | 25. 19 | 25. 47 | 26. 15 |
| 63 | 23. 35 | 24. 2 | 24. 29 | 24. 56 | 25. 23 |
| 64 | 22. 46 | 23. 12 | 23. 39 | 24. 5 | 24. 31 |
| 65 | 21. 57 | 22. 23 | 22. 48 | 23. 13 | 23. 39 |
| 66 | 21. 8 | 21. 32 | 21. 57 | 22. 21 | 22. 46 |
| 67 | 20. 18 | 20. 42 | 21. 5 | 21. 29 | 21. 52 |
| 68 | 19. 28 | 19. 51 | 20. 13 | 20. 36 | 20. 58 |
| 69 | 18. 38 | 18. 59 | 19. 21 | 19. 42 | 20. 4 |
| 70 | 17. 47 | 18. 7 | 18. 28 | 18. 49 | 19. 9 |
| 71 | 16. 56 | 17. 15 | 17. 35 | 17. 54 | 18. 14 |
| 72 | 16. 4 | 16. 23 | 16. 41 | 17. 0 | 17. 18 |
| 73 | 15. 12 | 15. 30 | 15. 47 | 16. 5 | 16. 23 |
| 74 | 14. 20 | 14. 37 | 14. 53 | 15. 10 | 15. 26 |
| 75 | 13. 28 | 13. 43 | 13. 59 | 14. 14 | 14. 30 |
| 76 | 12. 35 | 12. 50 | 13. 4 | 13. 19 | 13. 33 |
| 77 | 11. 42 | 11. 56 | 12. 9 | 12. 23 | 12. 36 |
| 78 | 10. 49 | 11. 2 | 11. 14 | 11. 27 | 11. 39 |
| 79 | 9. 55 | 10. 7 | 10. 19 | 10. 30 | 10. 42 |
| 80 | 9. 2 | 9. 13 | 9. 23 | 9. 33 | 9. 44 |
| 81 | 8. 8 | 8. 18 | 8. 27 | 8. 37 | 8. 46 |
| 82 | 7. 15 | 7. 23 | 7. 31 | 7. 40 | 7. 48 |
| 83 | 6. 21 | 6. 28 | 6. 35 | 6. 42 | 6. 50 |
| 84 | 5. 26 | 5. 33 | 5. 39 | 5. 45 | 5. 51 |
| 85 | 4. 32 | 4. 37 | 4. 43 | 4. 48 | 4. 53 |
| 86 | 3. 38 | 3. 42 | 3. 46 | 3. 50 | 3. 55 |
| 87 | 2. 43 | 2. 47 | 2. 50 | 2. 53 | 2. 56 |
| 88 | 1. 49 | 1. 51 | 1. 53 | 1. 55 | 1. 57 |
| 89 | 0. 54 | 0. 56 | 0. 57 | 0. 58 | 0. 59 |
| 90 | 0. 0 | 0. 0 | 0. 0 | 0. 0 | 0. 0 |

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A TABLE for reducing the apparent to the true Altitude of the Moon. I. concluded.

| Hor. Par. ☽ | ′ 58′ | ′ 59′ | ′ 60′ | ′ 61′ | ′ 62′ |
|---|---|---|---|---|---|
| Alt. ☽ | Corn. + | Corn. + | Corn. + | Corn. + | Corn. + |
| ° | ′ ″ | ′ ″ | ′ ″ | ′ ″ | ′ ″ |
| 60 | 28.27 | 28.57 | 29.27 | 29.57 | 30.27 |
| 61 | 27.35 | 28. 4 | 28.34 | 29. 3 | 29.32 |
| 62 | 26.43 | 27.11 | 27.40 | 28. 8 | 28.36 |
| 63 | 25.51 | 26.18 | 26.45 | 27.12 | 27.40 |
| 64 | 24.58 | 25.24 | 25.50 | 26.17 | 26.43 |
| 65 | 24. 4 | 24.30 | 24.55 | 25.20 | 25.46 |
| 66 | 23.10 | 23.34 | 23.59 | 24.23 | 24.48 |
| 67 | 22.16 | 22.39 | 23. 2 | 23.26 | 23.49 |
| 68 | 21.21 | 21.43 | 22. 6 | 22.28 | 22.51 |
| 69 | 20.25 | 20.47 | 21. 8 | 21.30 | 21.51 |
| 70 | 19.30 | 19.50 | 20.11 | 20.31 | 20.52 |
| 71 | 18.33 | 18.53 | 19.12 | 19.32 | 19.52 |
| 72 | 17.37 | 17.55 | 18.14 | 18.33 | 18.51 |
| 73 | 16.40 | 16.58 | 17.15 | 17.33 | 17.50 |
| 74 | 15.43 | 16. 0 | 16.16 | 16.33 | 16.49 |
| 75 | 14.46 | 15. 1 | 15.17 | 15.32 | 15.48 |
| 76 | 13.48 | 14. 2 | 14.17 | 14.31 | 14.46 |
| 77 | 12.50 | 13. 3 | 13.17 | 13.30 | 13.44 |
| 78 | 11.51 | 12. 4 | 12.16 | 12.29 | 12.41 |
| 79 | 10.53 | 11. 4 | 11.16 | 11.27 | 11.39 |
| 80 | 9.54 | 10. 5 | 10.15 | 10.25 | 10.36 |
| 81 | 8.55 | 9. 5 | 9.14 | 9.24 | 9.33 |
| 82 | 7.56 | 8. 5 | 8.13 | 8.21 | 8.30 |
| 83 | 6.57 | 7. 4 | 7.12 | 7.19 | 7.26 |
| 84 | 5.58 | 6. 4 | 6.10 | 6.17 | 6.23 |
| 85 | 4.58 | 5. 4 | 5. 9 | 5.14 | 5.19 |
| 86 | 3.59 | 4. 3 | 4. 7 | 4.11 | 4.15 |
| 87 | 2.59 | 3. 2 | 3. 5 | 3. 9 | 3.12 |
| 88 | 1.59 | 2. 2 | 2. 4 | 2. 6 | 2. 8 |
| 89 | 1. 0 | 1. 1 | 1. 2 | 1. 3 | 1. 4 |
| 90 | 0. 0 | 0. 0 | 0. 0 | 0. 0 | 0. 0 |



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A TABLE of Logarithmic Differences for readily computing the true Distance of the Moon from a Fixed Star.
II.

| Hor. Par. ☽ | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 |
|---|---|---|---|---|---|
| Alt. ☽ | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. |
| ° | | | | | |
| 0 | + 11.3 | + 11.2 | + 11.1 | + 11.0 | + 10.9 |
| 1 | + 4.2 | + 3.9 | + 3.6 | + 3.2 | + 2.9 |
| 2 | — 5.3 | — 5.9 | — 6.5 | — 7.1 | — 7.6 |
| 3 | 16.1 | 16.9 | 17.7 | 18.5 | 19.3 |
| 4 | 27.3 | 28.4 | 29.4 | 30.5 | 31.5 |
| 5 | 38.8 | 40.1 | 41.3 | 42.6 | 43.9 |
| 6 | 50.4 | 51.9 | 53.4 | 54.9 | 56.3 |
| 7 | 62.0 | 63.7 | 65.5 | 67.2 | 68.9 |
| 8 | 73.6 | 75.6 | 77.5 | 79.4 | 81.4 |
| 9 | 85.2 | 87.4 | 89.5 | 91.7 | 93.8 |
| 10 | 96.8 | 99.1 | 101.5 | 103.9 | 106.3 |
| 11 | 108.3 | 110.9 | 113.5 | 116.1 | 118.7 |
| 12 | 119.7 | 122.6 | 125.4 | 128.2 | 131.0 |
| 13 | 131.2 | 134.2 | 137.2 | 140.3 | 143.3 |
| 14 | 142.6 | 145.8 | 149.0 | 152.3 | 155.6 |
| 15 | 154.0 | 157.4 | 160.9 | 164.3 | 167.8 |
| 16 | 165.2 | 168.9 | 172.5 | 176.2 | 179.9 |
| 17 | 176.4 | 180.3 | 184.2 | 188.1 | 192.0 |
| 18 | 187.6 | 191.7 | 195.8 | 199.9 | 204.0 |
| 19 | 198.7 | 203.1 | 207.3 | 211.6 | 216.0 |
| 20 | 209.8 | 214.2 | 218.8 | 223.3 | 227.8 |
| 21 | 220.8 | 225.5 | 230.2 | 234.9 | 239.6 |
| 22 | 231.6 | 236.5 | 241.4 | 246.3 | 251.3 |
| 23 | 242.3 | 247.5 | 252.6 | 257.8 | 262.9 |
| 24 | 253.2 | 258.4 | 263.8 | 269.1 | 274.5 |
| 25 | 263.7 | 269.3 | 274.8 | 280.4 | 285.9 |
| 26 | 274.3 | 280.1 | 285.8 | 291.6 | 297.3 |
| 27 | 284.8 | 290.8 | 296.7 | 302.7 | 308.5 |
| 28 | 295.2 | 301.3 | 307.4 | 313.6 | 319.7 |
| 29 | 303.5 | 311.7 | 318.1 | 324.4 | 330.8 |
| 30 | 315.6 | 322.1 | 328.7 | 335.2 | 341.7 |

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A TABLE of Logarithmic Differences for readily computing the true Distance of the Moon from a Fixed Star. II. continued.

| Hor. Par. ☽ | ′ 58 | ′ 59 | ′ 60 | ′ 61 | ′ 62 |
|---|---|---|---|---|---|
| Alt. ☽ | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. |
| ° | | | | | |
| 0 | + 10.8 | + 10.8 | + 10.7 | + 10.6 | + 10.4 |
| 1 | + 2.5 | + 2.2 | + 1.8 | + 1.5 | + 1.1 |
| 2 | — 8.2 | — 8.8 | — 9.4 | — 10.0 | — 10.6 |
| 3 | 20.1 | 21.0 | 21.8 | 22.6 | 23.5 |
| 4 | 32.5 | 33.6 | 34.7 | 35.7 | 36.8 |
| 5 | 45.1 | 46.4 | 47.7 | 49.0 | 50.3 |
| 6 | 57.8 | 59.4 | 60.8 | 62.4 | 63.9 |
| 7 | 70.6 | 72.3 | 74.1 | 75.8 | 77.6 |
| 8 | 83.3 | 85.3 | 87.2 | 89.2 | 91.1 |
| 9 | 96.0 | 98.2 | 100.3 | 102.5 | 104.7 |
| 10 | 108.6 | 111.0 | 113.4 | 115.9 | 118.2 |
| 11 | 121.3 | 123.9 | 126.5 | 129.1 | 131.7 |
| 12 | 133.8 | 136.6 | 139.5 | 142.3 | 145.2 |
| 13 | 146.4 | 149.4 | 152.4 | 155.5 | 158.5 |
| 14 | 158.8 | 162.0 | 165.4 | 168.6 | 171.9 |
| 15 | 171.2 | 174.7 | 178.2 | 181.7 | 185.2 |
| 16 | 183.5 | 187.1 | 191.0 | 194.6 | 198.3 |
| 17 | 195.8 | 199.8 | 203.7 | 207.6 | 211.5 |
| 18 | 208.1 | 212.2 | 216.3 | 220.4 | 224.6 |
| 19 | 220.2 | 224.6 | 228.9 | 233.3 | 237.6 |
| 20 | 232.3 | 236.8 | 241.4 | 245.9 | 250.4 |
| 21 | 244.4 | 249.1 | 253.8 | 258.6 | 263.3 |
| 22 | 256.2 | 261.2 | 266.1 | 271.0 | 276.0 |
| 23 | 268.1 | 273.2 | 278.3 | 283.5 | 288.6 |
| 24 | 279.8 | 285.2 | 290.5 | 295.8 | 301.2 |
| 25 | 291.4 | 297.0 | 302.5 | 308.1 | 313.7 |
| 26 | 303.1 | 308.7 | 314.5 | 320.2 | 326.0 |
| 27 | 314.4 | 320.4 | 326.3 | 332.3 | 338.3 |
| 28 | 325.8 | 332.0 | 338.1 | 344.3 | 350.4 |
| 29 | 337.0 | 343.4 | 349.7 | 356.1 | 362.4 |
| 30 | 348.2 | 354.7 | 361.3 | 367.8 | 374.3 |



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A TABLE of Logarithmic Differences for readily computing the true Distance of the Moon from a Fixed Star, II. continued.

| Hor. Par. ☽ | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 |
|---|---|---|---|---|---|
| Alt. ☽ | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. |
| ° | | | | | |
| 30 | 315.6 | 322.1 | 328.7 | 335.2 | 341.7 |
| 31 | 325.7 | 332.4 | 339.1 | 345.8 | 352.5 |
| 32 | 335.7 | 342.5 | 349.4 | 356.3 | 363.2 |
| 33 | 345.5 | 352.6 | 359.7 | 366.8 | 373.8 |
| 34 | 355.3 | 362.6 | 369.8 | 377.1 | 384.3 |
| 35 | 364.9 | 372.3 | 379.8 | 387.2 | 394.7 |
| 36 | 374.4 | 382.0 | 389.7 | 397.3 | 404.9 |
| 37 | 383.8 | 391.6 | 399.3 | 407.2 | 415.0 |
| 38 | 393.1 | 401.1 | 409.0 | 417.0 | 425.0 |
| 39 | 402.3 | 410.4 | 418.5 | 426.7 | 434.8 |
| 40 | 411.3 | 419.6 | 427.9 | 436.2 | 444.6 |
| 41 | 420.2 | 428.7 | 437.2 | 445.6 | 454.1 |
| 42 | 428.9 | 437.6 | 446.2 | 454.9 | 463.5 |
| 43 | 437.5 | 446.4 | 455.2 | 464.0 | 472.8 |
| 44 | 446.0 | 455.0 | 464.0 | 472.9 | 481.9 |
| 45 | 454.4 | 463.5 | 472.6 | 481.8 | 490.9 |
| 46 | 462.6 | 471.8 | 481.1 | 490.4 | 499.7 |
| 47 | 470.6 | 480.0 | 489.5 | 498.9 | 508.4 |
| 48 | 478.5 | 488.1 | 497.7 | 507.3 | 516.9 |
| 49 | 486.3 | 496.0 | 505.7 | 515.5 | 525.2 |
| 50 | 493.9 | 503.8 | 513.6 | 523.5 | 533.4 |
| 51 | 501.4 | 511.4 | 521.4 | 531.4 | 541.4 |
| 52 | 508.7 | 518.8 | 529.0 | 539.1 | 549.3 |
| 53 | 515.8 | 526.1 | 536.3 | 546.6 | 556.9 |
| 54 | 522.7 | 533.2 | 543.6 | 554.0 | 564.4 |
| 55 | 529.5 | 540.1 | 550.6 | 561.2 | 571.7 |
| 56 | 536.1 | 546.8 | 557.5 | 568.1 | 578.8 |
| 57 | 542.6 | 553.4 | 564.2 | 574.9 | 585.7 |
| 58 | 548.8 | 559.7 | 570.6 | 581.6 | 592.5 |
| 59 | 554.9 | 565.9 | 577.0 | 588.0 | 599.1 |
| 60 | 560.8 | 571.9 | 583.1 | 594.2 | 605.4 |

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A TABLE of Logarithmic Differences for readily computing the true Distance of the Moon from a Fixed Star. II. continued.

| Hor. Par. ☽ | ′ 58 | ′ 59 | ′ 60 | ′ 61 | ′ 62 |
|---|---|---|---|---|---|
| Alt. ☽ | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. |
| ° | | | | | |
| 30 | 348.2 | 354.7 | 361.3 | 367.8 | 374.3 |
| 31 | 359.2 | 366.0 | 372.7 | 379.4 | 386.1 |
| 32 | 370.1 | 377.1 | 383.9 | 390.9 | 397.8 |
| 33 | 380.9 | 388.0 | 395.1 | 402.2 | 409.3 |
| 34 | 391.6 | 398.9 | 406.1 | 413.4 | 420.7 |
| 35 | 402.1 | 409.6 | 417.0 | 424.5 | 432.0 |
| 36 | 412.5 | 420.2 | 427.8 | 435.5 | 443.1 |
| 37 | 422.9 | 430.6 | 438.5 | 446.3 | 454.1 |
| 38 | 433.0 | 441.0 | 449.0 | 457.0 | 465.0 |
| 39 | 443.0 | 451.2 | 459.3 | 467.5 | 475.7 |
| 40 | 452.9 | 461.2 | 469.6 | 477.9 | 486.2 |
| 41 | 462.7 | 471.1 | 479.6 | 488.1 | 496.7 |
| 42 | 472.2 | 480.9 | 489.5 | 498.2 | 506.9 |
| 43 | 481.6 | 490.5 | 499.3 | 508.1 | 517.0 |
| 44 | 490.9 | 499.9 | 508.9 | 517.9 | 526.9 |
| 45 | 500.0 | 509.2 | 518.3 | 527.5 | 536.6 |
| 46 | 509.0 | 518.3 | 527.6 | 536.9 | 546.2 |
| 47 | 517.8 | 527.3 | 536.7 | 546.2 | 555.6 |
| 48 | 526.5 | 536.1 | 545.7 | 555.3 | 564.9 |
| 49 | 535.0 | 544.7 | 554.5 | 564.2 | 574.0 |
| 50 | 543.3 | 553.2 | 563.1 | 573.0 | 582.9 |
| 51 | 551.4 | 561.5 | 571.5 | 581.5 | 591.6 |
| 52 | 559.4 | 569.6 | 579.8 | 589.9 | 600.1 |
| 53 | 567.2 | 577.6 | 587.8 | 598.1 | 608.5 |
| 54 | 574.8 | 585.3 | 595.7 | 606.1 | 616.6 |
| 55 | 582.3 | 592.8 | 603.4 | 614.0 | 624.5 |
| 56 | 589.5 | 600.2 | 610.9 | 621.6 | 632.3 |
| 57 | 596.6 | 607.4 | 618.2 | 629.0 | 639.8 |
| 58 | 603.4 | 614.3 | 625.2 | 636.2 | 647.1 |
| 59 | 610.1 | 621.1 | 632.1 | 643.2 | 654.2 |
| 60 | 616.5 | 627.7 | 638.8 | 650.0 | 661.2 |

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A TABLE of Logarithmic Differences for readily computing the true Distance of the Moon from a Fixed Star. II. continued.

| Hor. Par. ☽ | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 |
|---|---|---|---|---|---|
| Alt. ☽ | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. |
| ° | | | | | |
| 60 | 560.8 | 571.9 | 583.1 | 594.2 | 605.4 |
| 61 | 566.5 | 577.8 | 589.0 | 600.3 | 611.5 |
| 62 | 572.1 | 583.5 | 594.8 | 606.2 | 617.5 |
| 63 | 577.6 | 589.0 | 600.4 | 611.9 | 623.4 |
| 64 | 582.8 | 594.3 | 605.9 | 617.4 | 629.0 |
| 65 | 587.9 | 599.5 | 611.0 | 622.8 | 634.4 |
| 66 | 592.7 | 604.4 | 616.2 | 627.9 | 639.7 |
| 67 | 597.3 | 609.2 | 621.0 | 632.8 | 644.7 |
| 68 | 601.8 | 613.8 | 625.7 | 637.6 | 649.5 |
| 69 | 606.1 | 618.2 | 630.2 | 642.2 | 654.2 |
| 70 | 610.2 | 622.3 | 634.4 | 646.5 | 658.5 |
| 71 | 614.2 | 626.3 | 638.5 | 650.6 | 662.7 |
| 72 | 617.8 | 630.1 | 642.4 | 654.5 | 666.7 |
| 73 | 621.1 | 633.7 | 645.9 | 658.2 | 670.5 |
| 74 | 624.7 | 637.0 | 649.4 | 661.7 | 674.2 |
| 75 | 627.9 | 640.3 | 652.7 | 665.1 | 677.5 |
| 76 | 630.9 | 643.3 | 655.7 | 668.2 | 680.6 |
| 77 | 633.6 | 646.0 | 658.5 | 671.1 | 683.6 |
| 78 | 636.0 | 648.6 | 661.2 | 673.7 | 686.3 |
| 79 | 638.3 | 650.9 | 663.5 | 676.1 | 688.7 |
| 80 | 640.5 | 653.1 | 665.7 | 678.3 | 691.0 |
| 81 | 642.3 | 654.9 | 667.7 | 680.4 | 693.1 |
| 82 | 644.0 | 656.7 | 669.4 | 682.2 | 694.9 |
| 83 | 645.5 | 658.2 | 671.0 | 683.8 | 696.5 |
| 84 | 646.9 | 659.5 | 672.3 | 685.2 | 697.9 |
| 85 | 647.9 | 660.7 | 673.5 | 686.4 | 699.1 |
| 86 | 648.8 | 661.6 | 674.5 | 687.3 | 700.1 |
| 87 | 649.5 | 662.3 | 675.2 | 688.0 | 700.9 |
| 88 | 650.1 | 662.9 | 676.0 | 688.5 | 701.5 |
| 89 | 650.3 | 663.2 | 676.2 | 688.9 | 701.8 |

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A TABLE of Logarithmic Differences for readily computing the true Distance of the Moon from a Fixed Star. II. concluded.

| Hor. Par. ☽ | ′ 58 | ′ 59 | ′ 60 | ′ 61 | ′ 61 |
|---|---|---|---|---|---|
| Alt. ☽ | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. | Log. Diff. |
| ° | | | | | |
| 60 | 616.5 | 627.7 | 638.8 | 650.0 | 661.2 |
| 61 | 622.8 | 634.0 | 645.3 | 656.6 | 667.9 |
| 62 | 628.9 | 640.3 | 651.6 | 663.0 | 674.4 |
| 63 | 634.8 | 646.3 | 657.8 | 669.2 | 680.7 |
| 64 | 640.6 | 652.1 | 663.7 | 675.3 | 686.9 |
| 65 | 646.1 | 657.8 | 669.4 | 681.1 | 692.8 |
| 66 | 651.4 | 663.2 | 674.9 | 686.7 | 698.4 |
| 67 | 656.5 | 668.3 | 680.2 | 692.0 | 703.9 |
| 68 | 661.4 | 673.3 | 685.3 | 697.2 | 709.2 |
| 69 | 666.2 | 678.1 | 690.2 | 702.2 | 714.2 |
| 70 | 670.6 | 682.7 | 694.8 | 706.9 | 719.0 |
| 71 | 674.9 | 687.0 | 699.2 | 711.3 | 723.5 |
| 72 | 678.9 | 691.2 | 703.4 | 715.6 | 727.9 |
| 73 | 682.8 | 695.1 | 707.4 | 719.7 | 732.0 |
| 74 | 686.5 | 698.8 | 711.2 | 723.5 | 735.9 |
| 75 | 689.9 | 702.3 | 714.7 | 727.1 | 739.6 |
| 76 | 693.2 | 705.6 | 718.1 | 730.6 | 743.0 |
| 77 | 696.1 | 708.6 | 721.2 | 733.8 | 746.2 |
| 78 | 698.8 | 711.4 | 724.0 | 736.6 | 749.1 |
| 79 | 701.3 | 714.0 | 726.5 | 739.2 | 751.8 |
| 80 | 703.6 | 716.3 | 729.0 | 741.6 | 754.3 |
| 81 | 705.7 | 718.4 | 731.1 | 743.8 | 756.5 |
| 82 | 707.6 | 720.3 | 733.1 | 745.8 | 758.5 |
| 83 | 709.3 | 722.0 | 734.8 | 747.5 | 760.3 |
| 84 | 710.7 | 723.5 | 736.2 | 748.9 | 761.8 |
| 85 | 711.9 | 724.7 | 737.5 | 750.1 | 763.1 |
| 86 | 712.9 | 725.7 | 738.5 | 751.3 | 764.2 |
| 87 | 713.7 | 726.5 | 739.3 | 752.1 | 765.0 |
| 88 | 714.2 | 727.1 | 740.0 | 752.8 | 765.6 |
| 89 | 714.5 | 727.3 | 740.3 | 753.1 | 766.0 |

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# USE

## OF THE PRECEDING

# TABLES.

### PROBLEM.

HAVING the apparent or observed Distance of the Moon from a Fixed Star, together with the observed Altitude of each, to find their true Distance.

### SOLUTION.

With the Moon's horizontal Parallax, and apparent Altitude, take out the Correction of her Altitude from Table I. also the logarithmic Difference from Table II. which reserve; and to the Correction of the Moon's Altitude add the Refraction of the Star; this Sum added to or subtracted from the Difference of the observed Altitudes, according as the Moon is higher or lower than the Star, gives the Difference of their true Altitudes.

Then, from the Natural cosine of the Difference of the apparent Altitudes subtract the Natural cosine of the observed Distance, and find the Logarithm of the Remainder, from which take the logarithmic Difference before reserved, and you will have a Logarithm, whose corresponding Number subtracted from the Natural cosine of the Difference of their true Altitudes leaves the Natural cosine of the true Distance required.

EXAMPLE.

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## EXAMPLE.

(From Mr. MASKELYNE's Mariner's Guide, p. 17, &c.)

1762, May 9, at 12h. 34'. 19" apparent Time at Greenwich, according to Account at Sea,

| | | ° ' " |
|---|---|---|
| The apparent Diſtance of the Moon's Centre from Spica Virginis was | | 51. 28. 35 |
| The apparent Altitude of the Star | | 24. 48 |
| The apparent Altitude of the Moon's Centre | | 12. 30 |
| Difference of the apparent or obſerved Altitudes | | 12. 18 |
| Correction of the Moon's Altitude from Table I. | ' " 50. 42 | |
| Refraction of the Star | 2. 3 | |
| Sum ſubſtracted | | 52. 45 |
| Difference of their true Altitudes | | 11. 25. 15 |
| Natural-coſine of the Difference of apparent Altitudes | | 97705 |
| Natural-coſine of 51°. 28'. 35", the apparent Diſtance | | 62283 |
| Difference of the Natural-coſines | | 35422 |
| Logarithm thereof | | 4.54927 |
| Logarithmic Difference taken from Table II. ſubſtract | | 135 |
| Remainder | | 4.54792 |
| Number correſponding thereunto | | 35312 |
| Natural-coſine of 11°. 25'. 15", the Difference of their true Altitudes | | 98020 |
| From which ſubſtract the above correſponding Number | | 35312 |
| Leaves Natural-coſine of 51°. 9'. 54", the Moon's true Diſtance from the Star | | 62708 |



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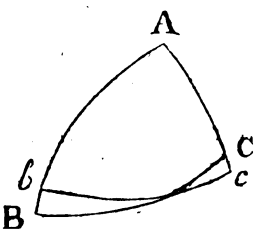
Note. If only the firſt five Figures of the Sines and Logarithms be uſed, they will commonly determine the Moon's true Diſtance from a Star, within 5″, or at moſt 10″; in which Caſe, the laſt Figure of the logarithmic Differences is to be omitted, and if the Star's Altitude be above 5°, the remaining Figures will need no Correction: but if greater Exactneſs be deſired, ſo that ſix Figures of the Sines and Logarithms be taken, all the Figures in the Table of logarithmic Differences are to be made uſe of; and if the Star's Altitude does not exceed 25°, are to be increaſed, as in the following Table.

| Alt. of the Star. | Particles to be added to Log. Diff. | Alt. of the Star. | Particles to be added to Log. Diff. |
|---|---|---|---|
| ° | | ° | |
| 2 | 4.4 | 10 | 0.4 |
| 3 | 2.7 | 11 | 0.3 |
| 4 | 1.8 | 12 | 0.3 |
| 5 | 1.3 | 13 | 0.2 |
| 6 | 0.9 | 14 | 0.2 |
| 7 | 0.7 | 15 | 0.1 |
| 8 | 0.6 | 20 | 0.1 |
| 9 | 0.5 | 25 | 0.1 |

## Inveſtigation of the foregoing Solution.

In the ſpherical Triangle B A C, wherein A repreſents the Zenith, B the Moon, and C the Star, are given the three Sides, to find how much the Baſe B C is altered, by varying the Sides A B and A C, while the Angle at the Vertex A remains the ſame.




As Sine A B × Sine A C : R$^{q}$ :: Ver.-ſine B C — Ver.-ſine $\overline{A B - A C}$ : Ver.-ſine A.

And, as Sine A $b$ × Sine A $c$ : R$^{q}$ :: Ver.-ſine $b c$ — Ver.-ſine $\overline{A b - A c}$ : Ver.-ſine A. Per Caſwell Trigon. Axiom. 4.

Then

Then by Inverſion, R$^{q}$ : Sine $Ab \times$ Sine $Ac$ :: Ver.-ſine A : Ver.-ſine $bc$ — Ver.-ſine $\overline{Ab - Ac}$.

And *ex æquo*, Sine AB × Sine AC : Sine $Ab \times$ Sine $Ac$ :: Ver.-ſine BC — Ver.-ſine $\overline{AB - AC}$ : Ver.-ſine $bc$ — Ver.-ſine $\overline{Ab - Ac}$.

But Ver.-ſine BC — Ver.-ſine $\overline{AB - AC}$ = Cof. $\overline{AB - AC}$ — Cof. BC.

And Ver.-ſine $bc$ — Ver.-ſine $\overline{Ab - Ac}$ = Cof. $\overline{Ab - Ac}$ — Cof. $bc$.

Therefore Sine AB × Sine AC : Sine $Ab \times Ac$ :: Cof. $\overline{AB - AC}$ — Cof. BC : Cof. $\overline{Ab - Ac}$ — Cof. $bc$.

Whence Log. of Cof. $\overline{AB - AC}$ — Cof. BC + Log. Sine $Ab$ + Log. Sine $Ac$ — Log. Sine AB — Log. Sine AC = Log. of Cof. $\overline{Ab - Ac}$ — Cof. $bc$.

But Log. Sine AB — Log. Sine $Ab$ — Log. Sine $Ac$ + Log. Sine AC = logarithmic Differences in Table II. by Conſtruction.

Wherefore Log. of Cof. $\overline{AB - AC}$ — Cof. BC — Log. Diff. from Table II. = Log. of Cof. $\overline{Ab - Ac}$ — Cof. $bc$.

Let Log. of Cof. $\overline{AB - AC}$ — Cof. BC — Log. Diff. from Table II. be called $n$, and its correſponding Number N.

Then will $n$ alſo = Log. of Cof. $\overline{Ab - Ac}$ — Cof. $bc$, and N = Cof. $\overline{Ab - Ac}$ — Cof. $bc$.

And by Tranſpoſition, Cof. $\overline{Ab - Ac}$ — N = Cof. $bc$, which was to be inveſtigated.

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A

# TABLE

OF

# Proportional Logarithms;

To be uſed with the

ASTRONOMICAL AND NAUTICAL

# EPHEMERIS.

LONDON:

Printed by W. BOWYER and J. NICHOLS:

AND SOLD BY

J. NOURSE, Bookſeller to his Majeſty, in the Strand;
and Meſſ. MOUNT and PAGE, on Towerhill.

MDCCLXVI.

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| " | ′ 0 | ′ 1 | ′ 2 | ′ 3 | ′ 4 | ′ 5 | ′ 6 |
|---|---|---|---|---|---|---|---|
| 0 | | 2.2553 | 1.9542 | 1.7782 | 1.6532 | 1.5563 | 1.4771 |
| 1 | 4.0334 | 2.2481 | 1.9506 | 1.7757 | 1.6514 | 1.5548 | 1.4759 |
| 2 | 3.7324 | 2.2410 | 1.9470 | 1.7733 | 1.6496 | 1.5534 | 1.4747 |
| 3 | 3.5563 | 2.2341 | 1.9435 | 1.7710 | 1.6478 | 1.5520 | 1.4735 |
| 4 | 3.4313 | 2.2272 | 1.9400 | 1.7686 | 1.6460 | 1.5505 | 1.4723 |
| 5 | 3.3344 | 2.2205 | 1.9365 | 1.7662 | 1.6442 | 1.5491 | 1.4711 |
| 6 | 3.2553 | 2.2139 | 1.9331 | 1.7639 | 1.6425 | 1.5477 | 1.4699 |
| 7 | 3.1883 | 2.2073 | 1.9296 | 1.7616 | 1.6407 | 1.5463 | 1.4687 |
| 8 | 3.1303 | 2.2009 | 1.9262 | 1.7592 | 1.6390 | 1.5449 | 1.4676 |
| 9 | 3.0792 | 2.1946 | 1.9228 | 1.7570 | 1.6372 | 1.5435 | 1.4664 |
| 10 | 3.0334 | 2.1883 | 1.9195 | 1.7546 | 1.6355 | 1.5420 | 1.4652 |
| 11 | 2.9920 | 2.1821 | 1.9161 | 1.7524 | 1.6337 | 1.5406 | 1.4640 |
| 12 | 2.9542 | 2.1761 | 1.9128 | 1.7501 | 1.6320 | 1.5393 | 1.4629 |
| 13 | 2.9195 | 2.1701 | 1.9096 | 1.7478 | 1.6303 | 1.5379 | 1.4617 |
| 14 | 2.8873 | 2.1642 | 1.9063 | 1.7456 | 1.6286 | 1.5365 | 1 4605 |
| 15 | 2.8573 | 2.1584 | 1.9031 | 1.7434 | 1.6269 | 1.5351 | 1.4594 |
| 16 | 2.8293 | 2.1526 | 1.8999 | 1.7411 | 1.6252 | 1.5337 | 1.4582 |
| 17 | 2.8030 | 2.1469 | 1.8967 | 1.7389 | 1.6235 | 1.5323 | 1.4571 |
| 18 | 2.7782 | 2.1413 | 1.8935 | 1.7368 | 1.6218 | 1.5310 | 1.4559 |
| 19 | 2.7546 | 2.1358 | 1.8904 | 1.7345 | 1.6201 | 1.5296 | 1.4548 |
| 20 | 2.7324 | 2.1303 | 1.8873 | 1.7324 | 1.6184 | 1.5283 | 1.4536 |
| 21 | 2.7112 | 2.1249 | 1.8842 | 1.7302 | 1.6168 | 1.5269 | 1.4525 |
| 22 | 2.6910 | 2.1196 | 1.8811 | 1.7281 | 1.6151 | 1.5255 | 1.4513 |
| 23 | 2.6717 | 2.1143 | 1.8781 | 1.7259 | 1.6134 | 1.5242 | 1.4502 |
| 24 | 2.6532 | 2.1091 | 1.8751 | 1.7238 | 1.6118 | 1.5229 | 1.4491 |
| 25 | 2.6355 | 2.1040 | 1.8720 | 1.7216 | 1.6102 | 1.5215 | 1.4479 |
| 26 | 2.6184 | 2.0989 | 1.8690 | 1.7195 | 1.6085 | 1.5202 | 1.4468 |
| 27 | 2.6021 | 2.0939 | 1.8661 | 1.7175 | 1.6069 | 1.5189 | 1.4457 |
| 28 | 2.5862 | 2.0889 | 1.8631 | 1.7153 | 1.6053 | 1.5175 | 1.4446 |
| 29 | 2.5710 | 2.0840 | 1.8602 | 1.7133 | 1.6037 | 1.5162 | 1.4435 |
| 30 | 2.5563 | 2.0792 | 1.8573 | 1.7112 | 1.6021 | 1.5149 | 1.4424 |

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| " | ′ 0 | ′ 1 | ′ 2 | ′ 3 | ′ 4 | ′ 5 | ′ 6 |
|---|---|---|---|---|---|---|---|
| 31 | 2.5420 | 2.0744 | 1.8544 | 1.7091 | 1.6004 | 1.5136 | 1.4412 |
| 32 | 2.5283 | 2.0696 | 1.8516 | 1.7071 | 1.5988 | 1.5123 | 1.4401 |
| 33 | 2.5149 | 2.0649 | 1.8487 | 1.7050 | 1.5973 | 1.5110 | 1.4390 |
| 34 | 2.5019 | 2.0603 | 1.8459 | 1.7030 | 1.5957 | 1.5097 | 1.4379 |
| 35 | 2.4893 | 2.0557 | 1.8431 | 1.7010 | 1.5941 | 1.5084 | 1.4368 |
| 36 | 2.4771 | 2.0512 | 1.8403 | 1.6990 | 1.5925 | 1.5071 | 1.4357 |
| 37 | 2.4652 | 2.0466 | 1.8375 | 1.6969 | 1.5909 | 1.5058 | 1.4346 |
| 38 | 2.4536 | 2.0422 | 1.8347 | 1.6949 | 1.5894 | 1.5045 | 1.4335 |
| 39 | 2.4424 | 2.0378 | 1.8320 | 1.6930 | 1.5878 | 1.5032 | 1.4325 |
| 40 | 2.4313 | 2.0334 | 1.8293 | 1.6910 | 1.5862 | 1.5019 | 1.4313 |
| 41 | 2.4206 | 2.0291 | 1.8266 | 1.6890 | 1.5847 | 1.5006 | 1.4303 |
| 42 | 2.4102 | 2.0248 | 1.8239 | 1.6871 | 1.5832 | 1.4994 | 1.4292 |
| 43 | 2.3999 | 2.0206 | 1.8212 | 1.6851 | 1.5816 | 1.4981 | 1.4281 |
| 44 | 2.3899 | 2.0164 | 1.8186 | 1.6832 | 1.5801 | 1.4968 | 1.4270 |
| 45 | 2.3802 | 2.0122 | 1.8159 | 1.6812 | 1.5786 | 1.4956 | 1.4260 |
| 46 | 2.3706 | 2.0081 | 1.8133 | 1.6793 | 1.5770 | 1.4943 | 1.4249 |
| 47 | 2.3613 | 2.0040 | 1.8107 | 1.6774 | 1.5755 | 1.4931 | 1.4238 |
| 48 | 2.3522 | 2.0000 | 1.8081 | 1.6755 | 1.5740 | 1.4918 | 1.4228 |
| 49 | 2.3432 | 1.9960 | 1.8055 | 1.6736 | 1.5725 | 1.4906 | 1.4217 |
| 50 | 2.3344 | 1.9920 | 1.8030 | 1.6717 | 1.5710 | 1.4893 | 1.4206 |
| 51 | 2.3259 | 1.9881 | 1.8004 | 1.6698 | 1.5695 | 1.4881 | 1.4196 |
| 52 | 2.3174 | 1.9842 | 1.7979 | 1.6679 | 1.5680 | 1.4869 | 1.4185 |
| 53 | 2.3091 | 1.9803 | 1.7954 | 1.6660 | 1.5665 | 1.4856 | 1.4175 |
| 54 | 2.3010 | 1.9765 | 1.7929 | 1.6642 | 1.5651 | 1.4844 | 1.4165 |
| 55 | 2.2930 | 1.9727 | 1.7904 | 1.6623 | 1.5636 | 1.4832 | 1.4154 |
| 56 | 2.2852 | 1.9689 | 1.7879 | 1.6605 | 1.5621 | 1.4820 | 1.4143 |
| 57 | 2.2775 | 1.9652 | 1.7855 | 1.6587 | 1.5607 | 1.4808 | 1.4133 |
| 58 | 2.2700 | 1.9615 | 1.7830 | 1.6568 | 1.5592 | 1.4795 | 1.4122 |
| 59 | 2.2626 | 1.9579 | 1.7805 | 1.6550 | 1.5577 | 1.4783 | 1.4112 |
| 602 | 2.2553 | 1.9542 | 1.7782 | 1.6532 | 1.5563 | 1.4771 | 1.4102 |



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| " | ′ 7 | ′ 8 | ′ 9 | ′ 10 | ′ 11 | ′ 12 | ′ 13 |
|---|---|---|---|---|---|---|---|
| 0 | 1.4102 | 1.3522 | 1.3010 | 1.2553 | 1.2139 | 1.1761 | 1.1413 |
| 1 | 1.4091 | 1.3513 | 1.3002 | 1.2545 | 1.2132 | 1.1755 | 1,1408 |
| 2 | 1.4081 | 1.3504 | 1.2994 | 1.2538 | 1.2125 | 1.1749 | 1.1402 |
| 3 | 1.4071 | 1.3495 | 1.2986 | 1.2531 | 1.2119 | 1.1743 | 1.1397 |
| 4 | 1.4060 | 1.3486 | 1.2978 | 1.2524 | 1.2112 | 1.1737 | 1.1391 |
| 5 | 1.4050 | 1.3477 | 1.2970 | 1.2517 | 1.2106 | 1.1731 | 1.1385 |
| 6 | 1.4040 | 1.3468 | 1.2962 | 1.2510 | 1.2099 | 1.1725 | 1.1380 |
| 7 | 1.4030 | 1.3459 | 1.2954 | 1.2502 | 1.2093 | 1.1719 | 1.1374 |
| 8 | 1.4020 | 1.3450 | 1.2946 | 1.2495 | 1.2086 | 1.1713 | 1.1369 |
| 9 | 1.4010 | 1.3441 | 1.2939 | 1.2488 | 1.2080 | 1.1707 | 1.1363 |
| 10 | 1.3999 | 1.3432 | 1.2931 | 1.2481 | 1.2073 | 1.1701 | 1.1358 |
| 11 | 1.3989 | 1.3423 | 1.2923 | 1.2474 | 1.2067 | 1.1695 | 1.1352 |
| 12 | 1.3979 | 1.3415 | 1.2915 | 1.2467 | 1.2061 | 1.1689 | 1.1347 |
| 13 | 1.3969 | 1.3406 | 1.2907 | 1.2459 | 1.2054 | 1.1683 | 1.1341 |
| 14 | 1.3959 | 1.3397 | 1.2899 | 1.2452 | 1.2047 | 1.1677 | 1.1336 |
| 15 | 1.3949 | 1.3388 | 1.2891 | 1.2445 | 1.2041 | 1.1671 | 1.1331 |
| 16 | 1.3939 | 1.3379 | 1.2883 | 1.2438 | 1.2035 | 1.1665 | 1.1325 |
| 17 | 1.3929 | 1.3370 | 1.2875 | 1.2431 | 1.2028 | 1.1659 | 1.1319 |
| 18 | 1.3919 | 1.3362 | 1.2868 | 1.2424 | 1.2022 | 1.1654 | 1.1314 |
| 19 | 1.3909 | 1.3353 | 1.2860 | 1.2417 | 1.2015 | 1.1648 | 1.1309 |
| 20 | 1.3899 | 1.3344 | 1.2852 | 1.2410 | 1.2009 | 1.1642 | 1.1303 |
| 21 | 1.3890 | 1.3336 | 1.2845 | 1.2403 | 1.2003 | 1.1636 | 1.1298 |
| 22 | 1.3880 | 1.3327 | 1.2837 | 1.2396 | 1.1996 | 1.1630 | 1.1292 |
| 23 | 1.3870 | 1.3318 | 1.2829 | 1.2389 | 1.1990 | 1.1624 | 1.1287 |
| 24 | 1.3860 | 1.3310 | 1.2821 | 1.2382 | 1.1984 | 1.1619 | 1.1282 |
| 25 | 1.3850 | 1.3301 | 1.2814 | 1.2375 | 1.1977 | 1.1613 | 1.1276 |
| 26 | 1.3841 | 1.3293 | 1.2806 | 1.2368 | 1.1971 | 1.1607 | 1.1271 |
| 27 | 1.3831 | 1.3284 | 1.2798 | 1.2362 | 1.1965 | 1.1601 | 1.1266 |
| 28 | 1.3821 | 1.3275 | 1.2791 | 1.2355 | 1.1958 | 1.1595 | 1.1260 |
| 29 | 1.3812 | 1.3267 | 1.2783 | 1.2348 | 1.1952 | 1.1589 | 1.1255 |
| 30 | 1.3802 | 1.3259 | 1.2775 | 1.2341 | 1.1946 | 1.1584 | 1.1249 |

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| ″ | ′ 7 | ′ 8 | ′ 9 | ′ 10 | ′ 11 | ′ 12 | ′ 13 |
|---|---|---|---|---|---|---|---|
| 31 | 1.3792 | 1.3250 | 1.2768 | 1.2334 | 1.1939 | 1.1578 | 1.1244 |
| 32 | 1.3783 | 1.3241 | 1.2760 | 1.2327 | 1.1933 | 1.1572 | 1.1238 |
| 33 | 1.3773 | 1.3233 | 1.2753 | 1.2320 | 1.1927 | 1.1566 | 1.1233 |
| 34 | 1.3763 | 1.3224 | 1.2745 | 1.2313 | 1.1920 | 1.1560 | 1.1228 |
| 35 | 1.3754 | 1.3216 | 1.2737 | 1.2306 | 1.1914 | 1.1555 | 1.1222 |
| 36 | 1.3745 | 1.3208 | 1.2730 | 1.2300 | 1.1908 | 1.1549 | 1.1217 |
| 37 | 1.3735 | 1.3199 | 1.2722 | 1.2293 | 1.1902 | 1.1543 | 1.1212 |
| 38 | 1.3725 | 1.3191 | 1.2715 | 1.2286 | 1.1895 | 1.1537 | 1.1206 |
| 39 | 1.3716 | 1.3183 | 1.2707 | 1.2279 | 1.1889 | 1.1532 | 1.1201 |
| 40 | 1.3706 | 1.3174 | 1.2700 | 1.2272 | 1.1883 | 1.1526 | 1.1196 |
| 41 | 1.3697 | 1.3166 | 1.2692 | 1.2265 | 1.1877 | 1.1520 | 1.1191 |
| 42 | 1.3688 | 1.3158 | 1.2685 | 1.2259 | 1.1871 | 1.1515 | 1.1186 |
| 43 | 1.3678 | 1.3149 | 1.2677 | 1.2252 | 1.1864 | 1.1509 | 1.1180 |
| 44 | 1.3669 | 1.3141 | 1.2670 | 1.2245 | 1.1858 | 1.1503 | 1.1175 |
| 45 | 1.3660 | 1.3133 | 1.2663 | 1.2239 | 1.1852 | 1.1498 | 1.1170 |
| 46 | 1.3650 | 1.3124 | 1.2655 | 1.2232 | 1.1846 | 1.1492 | 1.1164 |
| 47 | 1.3641 | 1.3116 | 1.2648 | 1.2225 | 1.1840 | 1.1486 | 1.1159 |
| 48 | 1.3632 | 1.3108 | 1.2640 | 1.2218 | 1.1834 | 1.1481 | 1.1154 |
| 49 | 1.3622 | 1.3099 | 1.2633 | 1.2212 | 1.1828 | 1.1475 | 1.1148 |
| 50 | 1.3613 | 1.3091 | 1.2626 | 1.2205 | 1.1822 | 1.1469 | 1.1143 |
| 51 | 1.3604 | 1.3083 | 1.2618 | 1.2198 | 1.1816 | 1.1464 | 1.1138 |
| 52 | 1.3595 | 1.3075 | 1.2611 | 1.2192 | 1.1809 | 1.1458 | 1.1133 |
| 53 | 1.3585 | 1.3067 | 1.2603 | 1.2185 | 1.1803 | 1.1452 | 1.1128 |
| 54 | 1.3576 | 1.3059 | 1.2596 | 1.2178 | 1.1797 | 1.1447 | 1.1123 |
| 55 | 1.3567 | 1.3050 | 1.2589 | 1.2172 | 1.1791 | 1.1441 | 1.1117 |
| 56 | 1.3558 | 1.3042 | 1.2582 | 1.2165 | 1.1785 | 1.1435 | 1.1112 |
| 57 | 1.3549 | 1.3034 | 1.2574 | 1.2159 | 1.1779 | 1.1430 | 1.1107 |
| 58 | 1.3540 | 1.3026 | 1.2567 | 1.2152 | 1.1773 | 1.1424 | 1.1102 |
| 59 | 1.3531 | 1.3018 | 1.2560 | 1.2145 | 1.1767 | 1.1419 | 1.1096 |
| 60 | 1.3522 | 1.3010 | 1.2553 | 1.2139 | 1.1761 | 1.1413 | 1.1091 |

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| " | ′ 14 | ′ 15 | ′ 16 | ′ 17 | ′ 18 | ′ 19 | ′ 20 | ′ 21 |
|---|---|---|---|---|---|---|---|---|
| 0 | 1.1091 | 1.0792 | 1.0512 | 1.0248 | 0000 | 9765 | 9542 | 9331 |
| 1 | 1.1086 | 1.0787 | 1.0507 | 1.0244 | 9996 | 9761 | 9539 | 9327 |
| 2 | 1.1081 | 1.0782 | 1.0502 | 1.0240 | 9992 | 9757 | 9535 | 9323 |
| 3 | 1.1076 | 1.0777 | 1.0498 | 1.0235 | 9988 | 9754 | 9532 | 9320 |
| 4 | 1.1071 | 1.0772 | 1.0493 | 1.0231 | 9984 | 9750 | 9528 | 9317 |
| 5 | 1.1066 | 1.0768 | 1.0489 | 1.0227 | 9980 | 9746 | 9524 | 9313 |
| 6 | 1.1061 | 1 0763 | 1.0484 | 1.0223 | 9976 | 9742 | 9521 | 9310 |
| 7 | 1.1055 | 1.0758 | 1.0480 | 1.0218 | 9972 | 9738 | 9517 | 9306 |
| 8 | 1.1050 | 1.0753 | 1.0475 | 1.0214 | 9968 | 9735 | 9513 | 9303 |
| 9 | 1.1045 | 1.0749 | 1.0471 | 1.0210 | 9964 | 9731 | 9510 | 9300 |
| 10 | 1.1040 | 1.0744 | 1.0466 | 1.0206 | 9960 | 9727 | 9506 | 9296 |
| 11 | 1.1035 | 1.0739 | 1.0462 | 1.0201 | 9956 | 9723 | 9503 | 9293 |
| 12 | 1.1030 | 1.0734 | 1.0458 | 1.0197 | 9952 | 9720 | 9499 | 9289 |
| 13 | 1.1025 | 1.0729 | 1.0453 | 1.0193 | 9948 | 9716 | 9495 | 9286 |
| 14 | 1.1020 | 1.0725 | 1.0448 | 1.0189 | 9944 | 9712 | 9492 | 9282 |
| 15 | 1.1015 | 1.0720 | 1.0444 | 1.0185 | 9940 | 9708 | 9488 | 9279 |
| 16 | 1.1009 | 1.0715 | 1.0440 | 1.0180 | 9936 | 9704 | 9485 | 9276 |
| 17 | 1.1004 | 1.0710 | 1.0435 | 1.0176 | 9932 | 9701 | 9481 | 9272 |
| 18 | 1.0999 | 1.0706 | 1.0431 | 1.0172 | 9928 | 9697 | 9478 | 9269 |
| 19 | 1.0994 | 1.0701 | 1:0426 | 1.0168 | 9924 | 9693 | 9474 | 9265 |
| 20 | 1.0989 | 1.0696 | 1:0422 | 1.0164 | 9920 | 9689 | 9470 | 9262 |
| 21 | 1.0984 | 1.0692 | 1.0418 | 1.0160 | 9916 | 9686 | 9467 | 9259 |
| 22 | 1.0979 | 1.0687 | 1.0413 | 1.0155 | 9912 | 9682 | 9463 | 9255 |
| 23 | 1.0974 | 1.0682 | 1.0408 | 1.0151 | 9908 | 9678 | 9460 | 9252 |
| 24 | 1.0969 | 1.0678 | 1.0404 | 1 0147 | 9905 | 9675 | 9456 | 9249 |
| 25 | 1.0964 | 1.0673 | 1.0400 | 1.0143 | 9901 | 9671 | 9453 | 9245 |
| 26 | 1.0959 | 1.0668 | 1.0395 | 1.0139 | 9897 | 9667 | 9449 | 9242 |
| 27 | 1.0954 | 1.0663 | 1.0391 | 1.0135 | 9893 | 9664 | 9446 | 9238 |
| 28 | 1 0949 | 1.0659 | 1.0386 | 1.0130 | 9889 | 9660 | 9442 | 9235 |
| 29 | 1.0944 | 1.0654 | 1.0382 | 1.0126 | 9885 | 9656 | 9439 | 9231 |
| 30 | 1.0939 | 1.0649 | 1.0378 | 1.0122 | 9881 | 9652 | 9435 | 9228 |

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| " | ′ 14 | ′ 15 | ′ 16 | ′ 17 | ′ 18 | ′ 19 | ′ 20 | ′ 21 |
|---|---|---|---|---|---|---|---|---|
| 31 | 1.0934 | 1 0645 | 1.0373 | 1.0118 | 9877 | 9648 | 9431 | 9225 |
| 32 | 1.0929 | 1.0640 | 1.0369 | 1.0114 | 9873 | 9645 | 9428 | 9221 |
| 33 | 1.0924 | 1 0635 | 1.0365 | 1.0110 | 9869 | 9641 | 9425 | 9218 |
| 34 | 1.0919 | 1.0631 | 1.0360 | 1.0106 | 9865 | 9637 | 9421 | 9215 |
| 35 | 1.0914 | 1.0626 | 1.0356 | 1.0102 | 9861 | 9634 | 9417 | 9211 |
| 36 | 1 0909 | 1.0621 | 1.0352 | 1.0098 | 9858 | 9630 | 9414 | 9208 |
| 37 | 1.0904 | 1.0617 | 1.0347 | 1.0093 | 9854 | 9626 | 9410 | 9205 |
| 38 | 1.0899 | 1.0612 | 1.0343 | 1.0089 | 9850 | 9623 | 9407 | 9201 |
| 39 | 1.0894 | 1.0608 | 1.0339 | 1.0085 | 9846 | 9619 | 9404 | 9198 |
| 40 | 1.0889 | 1.0603 | 1.0334 | 1.0081 | 9842 | 9615 | 9400 | 9195 |
| 41 | 1.0884 | 1.0598 | 1.0330 | 1.0077 | 9838 | 9612 | 9396 | 9191 |
| 42 | 1.0880 | 1.0594 | 1.0326 | 1.0073 | 9834 | 9608 | 9393 | 9188 |
| 43 | 1.0875 | 1.0589 | 1.0321 | 1.0069 | 9830 | 9604 | 9389 | 9185 |
| 44 | 1.0870 | 1.0584 | 1 0317 | 1.0065 | 9826 | 9601 | 9386 | 9181 |
| 45 | 1.0865 | 1.0580 | 1.0313 | 1.0061 | 9823 | 9597 | 9383 | 9178 |
| 46 | 1.0860 | 1.0575 | 1.0308 | 1 0057 | 9819 | 9593 | 9379 | 9175 |
| 47 | 1.0855 | 1.0571 | 1.0304 | 1.0053 | 9815 | 9590 | 9375 | 9171 |
| 48 | 1.0850 | 1.0566 | 1.0300 | 1.0049 | 9811 | 9586 | 9372 | 9168 |
| 49 | 1.0845 | 1.0561 | 1.0295 | 1.0044 | 9807 | 9582 | 9368 | 9165 |
| 50 | 1.0840 | 1.0557 | 1.0291 | 1.0040 | 9803 | 9579 | 9365 | 9161 |
| 51 | 1.0835 | 1.0552 | 1.0287 | 1.0036 | 9800 | 9575 | 9362 | 9158 |
| 52 | 1.0830 | 1 0548 | 1.0282 | 1.0032 | 9796 | 9571 | 9358 | 9155 |
| 53 | 1.0826 | 1.0543 | 1.0278 | 1.0028 | 9792 | 9568 | 9355 | 9151 |
| 54 | 1.0821 | 1.0539 | 1.0274 | 1.0024 | 9788 | 9564 | 9351 | 9148 |
| 55 | 1.0816 | 1.0534 | 1.0269 | 1.0020 | 9784 | 9560 | 9348 | 9145 |
| 56 | 1.0811 | 1.0529 | 1.0265 | 1.0016 | 9780 | 9557 | 9344 | 9141 |
| 57 | 1.0806 | 1.0525 | 1.0261 | 1.0012 | 9777 | 9553 | 9341 | 9138 |
| 58 | 1.0801 | 1.0520 | 1.0257 | 1.0008 | 9773 | 9549 | 9337 | 9135 |
| 59 | 1.0796 | 1.0516 | 1.0252 | 1.0004 | 9769 | 9546 | 9334 | 9132 |
| 60 | 1.0792 | 1.0511 | 1.0248 | 1.0000 | 9765 | 9542 | 9331 | 9128 |

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| " | ′ 22 | ′ 23 | ′ 24 | ′ 25 | ′ 26 | ′ 27 | ′ 28 | ′ 29 | ′ 30 | ′ 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 9128 | 8935 | 8751 | 8573 | 8403 | 8239 | 8081 | 7929 | 7782 | 7639 |
| 1 | 9125 | 8932 | 8748 | 8570 | 8400 | 8236 | 8078 | 7926 | 7779 | 7637 |
| 2 | 9122 | 8929 | 8745 | 8567 | 8397 | 8234 | 8076 | 7924 | 7776 | 7634 |
| 3 | 9119 | 8926 | 8742 | 8565 | 8395 | 8231 | 8073 | 7921 | 7774 | 7632 |
| 4 | 9115 | 8923 | 8739 | 8562 | 8392 | 8228 | 8071 | 7919 | 7772 | 7630 |
| 5 | 9112 | 8920 | 8736 | 8559 | 8389 | 8225 | 8068 | 7916 | 7769 | 7627 |
| 6 | 9109 | 8917 | 8733 | 8556 | 8386 | 8223 | 8066 | 7914 | 7767 | 7625 |
| 7 | 9105 | 8913 | 8730 | 8553 | 8383 | 8220 | 8063 | 7911 | 7764 | 7623 |
| 8 | 9102 | 8910 | 8727 | 8550 | 8381 | 8217 | 8060 | 7909 | 7762 | 7620 |
| 9 | 9099 | 8907 | 8724 | 8547 | 8378 | 8215 | 8058 | 7906 | 7760 | 7618 |
| 10 | 9096 | 8904 | 8721 | 8544 | 8375 | 8212 | 8055 | 7904 | 7757 | 7616 |
| 11 | 9092 | 8901 | 8718 | 8541 | 8372 | 8209 | 8053 | 7901 | 7755 | 7613 |
| 12 | 9089 | 8898 | 8715 | 8539 | 8370 | 8207 | 8050 | 7899 | 7753 | 7611 |
| 13 | 9086 | 8895 | 8712 | 8536 | 8367 | 8204 | 8047 | 7896 | 7750 | 7609 |
| 14 | 9082 | 8891 | 8709 | 8533 | 8364 | 8202 | 8045 | 7894 | 7748 | 7606 |
| 15 | 9079 | 8888 | 8706 | 8530 | 8361 | 8199 | 8043 | 7891 | 7745 | 7604 |
| 16 | 9076 | 8885 | 8703 | 8527 | 8358 | 8196 | 8040 | 7889 | 7743 | 7602 |
| 17 | 9073 | 8882 | 8700 | 8524 | 8356 | 8194 | 8037 | 7886 | 7740 | 7599 |
| 18 | 9070 | 8879 | 8697 | 8522 | 8353 | 8191 | 8035 | 7884 | 7738 | 7597 |
| 19 | 9066 | 8876 | 8694 | 8519 | 8350 | 8188 | 8032 | 7881 | 7736 | 7595 |
| 20 | 9063 | 8873 | 8691 | 8516 | 8347 | 8186 | 8030 | 7879 | 7733 | 7592 |
| 21 | 9060 | 8870 | 8688 | 8513 | 8345 | 8183 | 8027 | 7877 | 7731 | 7590 |
| 22 | 9056 | 8867 | 8685 | 8510 | 8342 | 8180 | 8024 | 7874 | 7729 | 7588 |
| 23 | 9053 | 8864 | 8682 | 8507 | 8339 | 8178 | 8022 | 7872 | 7726 | 7586 |
| 24 | 9050 | 8861 | 8679 | 8504 | 8337 | 8175 | 8020 | 7869 | 7724 | 7583 |
| 25 | 9047 | 8857 | 8676 | 8501 | 8334 | 8172 | 8017 | 7867 | 7721 | 7581 |
| 26 | 9044 | 8854 | 8673 | 8498 | 8331 | 8170 | 8014 | 7864 | 7719 | 7579 |
| 27 | 9041 | 8851 | 8670 | 8496 | 8328 | 8167 | 8012 | 7862 | 7717 | 7577 |
| 28 | 9037 | 8848 | 8667 | 8493 | 8326 | 8164 | 8009 | 7859 | 7714 | 7574 |
| 29 | 9034 | 8845 | 8664 | 8490 | 8323 | 8162 | 8007 | 7857 | 7712 | 7572 |
| 30 | 9031 | 8842 | 8661 | 8487 | 8320 | 8159 | 8004 | 7855 | 7710 | 7570 |

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| ″ | ′ 22 | ′ 23 | ′ 24 | ′ 25 | ′ 26 | ′ 27 | ′ 28 | ′ 29 | ′ 30 | ′ 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 9027 | 8839 | 8658 | 8484 | 8317 | 8157 | 8002 | 7852 | 7707 | 7567 |
| 32 | 9024 | 8836 | 8655 | 8481 | 8315 | 8154 | 7999 | 7849 | 7705 | 7565 |
| 33 | 9021 | 8833 | 8652 | 8479 | 8312 | 8152 | 7997 | 7847 | 7703 | 7563 |
| 34 | 9018 | 8830 | 8649 | 8476 | 8309 | 8149 | 7994 | 7844 | 7700 | 7560 |
| 35 | 9015 | 8827 | 8646 | 8473 | 8306 | 8146 | 7991 | 7842 | 7698 | 7558 |
| 36 | 9012 | 8824 | 8643 | 8470 | 8304 | 8144 | 7989 | 7840 | 7696 | 7556 |
| 37 | 9008 | 8820 | 8640 | 8467 | 8301 | 8141 | 7986 | 7837 | 7693 | 7553 |
| 38 | 9005 | 8817 | 8637 | 8464 | 8298 | 8138 | 7984 | 7835 | 7691 | 7551 |
| 39 | 9002 | 8814 | 8635 | 8462 | 8296 | 8136 | 7981 | 7832 | 7688 | 7549 |
| 40 | 8999 | 8811 | 8632 | 8459 | 8293 | 8133 | 7979 | 7830 | 7686 | 7546 |
| 41 | 8995 | 8808 | 8629 | 8456 | 8290 | 8130 | 7976 | 7827 | 7683 | 7544 |
| 42 | 8992 | 8805 | 8626 | 8453 | 8288 | 8128 | 7974 | 7825 | 7681 | 7542 |
| 43 | 8989 | 8802 | 8623 | 8450 | 8285 | 8125 | 7971 | 7823 | 7679 | 7540 |
| 44 | 8986 | 8799 | 8620 | 8448 | 8282 | 8122 | 7969 | 7820 | 7676 | 7537 |
| 45 | 8983 | 8796 | 8617 | 8445 | 8279 | 8120 | 7966 | 7818 | 7674 | 7535 |
| 46 | 8980 | 8793 | 8614 | 8442 | 8277 | 8117 | 7964 | 7815 | 7672 | 7533 |
| 47 | 8976 | 8790 | 8611 | 8439 | 8274 | 8115 | 7961 | 7813 | 7669 | 7531 |
| 48 | 8973 | 8787 | 8608 | 8437 | 8271 | 8112 | 7959 | 7811 | 7667 | 7528 |
| 49 | 8970 | 8784 | 8605 | 8434 | 8268 | 8109 | 7956 | 7808 | 7665 | 7526 |
| 50 | 8967 | 8781 | 8602 | 8431 | 8266 | 8107 | 7954 | 7805 | 7662 | 7524 |
| 51 | 8964 | 8778 | 8599 | 8428 | 8263 | 8104 | 7951 | 7803 | 7660 | 7522 |
| 52 | 8960 | 8775 | 8596 | 8425 | 8260 | 8102 | 7949 | 7801 | 7658 | 7519 |
| 53 | 8957 | 8772 | 8593 | 8422 | 8258 | 8099 | 7946 | 7798 | 7655 | 7517 |
| 54 | 8954 | 8769 | 8591 | 8420 | 8255 | 8097 | 7944 | 7796 | 7653 | 7515 |
| 55 | 8951 | 8766 | 8588 | 8417 | 8252 | 8094 | 7941 | 7793 | 7651 | 7512 |
| 56 | 8948 | 8763 | 8585 | 8414 | 8250 | 8091 | 7939 | 7791 | 7648 | 7510 |
| 57 | 8945 | 8760 | 8582 | 8411 | 8247 | 8089 | 7936 | 7789 | 7646 | 7508 |
| 58 | 8942 | 8757 | 8579 | 8408 | 8244 | 8086 | 7934 | 7786 | 7644 | 7506 |
| 59 | 8938 | 8754 | 8576 | 8406 | 8242 | 8084 | 7931 | 7784 | 7641 | 7503 |
| 60 | 8935 | 8751 | 8573 | 8403 | 8239 | 8081 | 7929 | 7782 | 7639 | 7501 |



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| " | ′ 32 | ′ 33 | ′ 34 | ′ 35 | ′ 36 | ′ 37 | ′ 38 | ′ 39 | ′ 40 | ′ 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 7501 | 7368 | 7238 | 7112 | 6990 | 6871 | 6755 | 6642 | 6532 | 6425 |
| 1 | 7499 | 7365 | 7236 | 7110 | 6988 | 6869 | 6753 | 6640 | 6530 | 6423 |
| 2 | 7496 | 7363 | 7234 | 7108 | 6986 | 6867 | 6751 | 6638 | 6528 | 6421 |
| 3 | 7494 | 7361 | 7232 | 7106 | 6984 | 6865 | 6749 | 6637 | 6527 | 6420 |
| 4 | 7492 | 7359 | 7229 | 7104 | 6982 | 6863 | 6747 | 6635 | 6525 | 6418 |
| 5 | 7490 | 7356 | 7227 | 7102 | 6980 | 6861 | 6745 | 6633 | 6523 | 6416 |
| 6 | 7488 | 7354 | 7225 | 7100 | 6978 | 6859 | 6743 | 6631 | 6521 | 6414 |
| 7 | 7485 | 7352 | 7223 | 7097 | 6976 | 6857 | 6741 | 6629 | 6519 | 6412 |
| 8 | 7483 | 7350 | 7221 | 7095 | 6974 | 6855 | 6739 | 6627 | 6517 | 6411 |
| 9 | 7481 | 7348 | 7219 | 7093 | 6972 | 6853 | 6738 | 6625 | 6516 | 6409 |
| 10 | 7478 | 7345 | 7216 | 7091 | 6970 | 6851 | 6736 | 6623 | 6514 | 6407 |
| 11 | 7476 | 7343 | 7214 | 7089 | 6968 | 6849 | 6734 | 6621 | 6512 | 6405 |
| 12 | 7474 | 7341 | 7212 | 7087 | 6966 | 6847 | 6732 | 6620 | 6510 | 6404 |
| 13 | 7472 | 7339 | 7210 | 7085 | 6964 | 6845 | 6730 | 6618 | 6508 | 6402 |
| 14 | 7469 | 7337 | 7208 | 7083 | 6962 | 6843 | 6728 | 6616 | 6507 | 6400 |
| 15 | 7467 | 7335 | 7206 | 7081 | 6960 | 6841 | 6726 | 6614 | 6505 | 6398 |
| 16 | 7465 | 7332 | 7204 | 7079 | 6958 | 6839 | 6724 | 6612 | 6503 | 6397 |
| 17 | 7463 | 7330 | 7202 | 7077 | 6956 | 6837 | 6722 | 6610 | 6501 | 6395 |
| 18 | 7461 | 7328 | 7200 | 7075 | 6954 | 6836 | 6721 | 6609 | 6500 | 6393 |
| 19 | 7458 | 7326 | 7197 | 7073 | 6952 | 6834 | 6719 | 6607 | 6498 | 6391 |
| 20 | 7456 | 7324 | 7195 | 7071 | 6950 | 6832 | 6717 | 6605 | 6496 | 6390 |
| 21 | 7454 | 7322 | 7193 | 7069 | 6948 | 6830 | 6715 | 6603 | 6494 | 6388 |
| 22 | 7452 | 7319 | 7191 | 7067 | 6946 | 6828 | 6713 | 6601 | 6492 | 6386 |
| 23 | 7449 | 7317 | 7189 | 7065 | 6944 | 6826 | 6711 | 6599 | 6490 | 6384 |
| 24 | 7447 | 7315 | 7187 | 7063 | 6942 | 6824 | 6709 | 6598 | 6489 | 6383 |
| 25 | 7445 | 7313 | 7185 | 7061 | 6940 | 6822 | 6707 | 6596 | 6487 | 6381 |
| 26 | 7443 | 7311 | 7183 | 7059 | 6938 | 6820 | 6705 | 6594 | 6485 | 6379 |
| 27 | 7441 | 7309 | 7181 | 7057 | 6936 | 6818 | 6704 | 6592 | 6484 | 6377 |
| 28 | 7438 | 7306 | 7179 | 7054 | 6934 | 6816 | 6702 | 6590 | 6482 | 6376 |
| 29 | 7436 | 7304 | 7177 | 7052 | 6932 | 6814 | 6700 | 6588 | 6480 | 6374 |
| 30 | 7434 | 7302 | 7175 | 7050 | 6930 | 6812 | 6698 | 6587 | 6478 | 6372 |

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| " | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 7431 | 7300 | 7172 | 7048 | 6928 | 6810 | 6696 | 6585 | 6476 | 6370 |
| 32 | 7429 | 7298 | 7170 | 7046 | 6926 | 6808 | 6694 | 6583 | 6474 | 6369 |
| 33 | 7427 | 7296 | 7168 | 7044 | 6924 | 6807 | 6692 | 6581 | 6473 | 6367 |
| 34 | 7425 | 7293 | 7166 | 7042 | 6922 | 6805 | 6690 | 6579 | 6471 | 6465 |
| 35 | 7423 | 7291 | 7164 | 7040 | 6920 | 6803 | 6689 | 6577 | 6469 | 6363 |
| 36 | 7421 | 7289 | 7162 | 7038 | 6918 | 6801 | 6687 | 6576 | 6467 | 6362 |
| 37 | 7418 | 7287 | 7160 | 7036 | 6916 | 6799 | 6685 | 6574 | 6465 | 6360 |
| 38 | 7416 | 7285 | 7158 | 7034 | 6914 | 6797 | 6683 | 6572 | 6464 | 6358 |
| 39 | 7414 | 7283 | 7156 | 7032 | 6912 | 6795 | 6681 | 6570 | 6462 | 6357 |
| 40 | 7411 | 7281 | 7153 | 7030 | 6910 | 6793 | 6679 | 6568 | 6460 | 6355 |
| 41 | 7409 | 7278 | 7151 | 7028 | 6908 | 6791 | 6677 | 6566 | 6458 | 6353 |
| 42 | 7407 | 7276 | 7149 | 7026 | 6906 | 6789 | 6676 | 6565 | 6457 | 6351 |
| 43 | 7405 | 7274 | 7147 | 7024 | 6904 | 6787 | 6674 | 6563 | 6455 | 6349 |
| 44 | 7403 | 7272 | 7145 | 7022 | 6902 | 6785 | 6672 | 6561 | 6453 | 6348 |
| 45 | 7401 | 7270 | 7143 | 7020 | 6900 | 6784 | 6670 | 6559 | 6451 | 6346 |
| 46 | 7398 | 7268 | 7141 | 7018 | 6898 | 6782 | 6668 | 6557 | 6449 | 6344 |
| 47 | 7396 | 7266 | 7139 | 7016 | 6896 | 6780 | 6666 | 6556 | 6448 | 6342 |
| 48 | 7394 | 7264 | 7137 | 7014 | 6894 | 6778 | 6664 | 6554 | 6446 | 6341 |
| 49 | 7392 | 7261 | 7135 | 7912 | 6892 | 6776 | 6662 | 6552 | 9444 | 6339 |
| 50 | 7389 | 7259 | 7133 | 7010 | 6890 | 6774 | 6660 | 6550 | 6442 | 6337 |
| 51 | 7387 | 7257 | 7131 | 7008 | 6888 | 6772 | 6659 | 6548 | 6441 | 6336 |
| 52 | 7385 | 7255 | 7128 | 7006 | 6886 | 6770 | 6657 | 6546 | 6439 | 6334 |
| 53 | 7383 | 7253 | 7126 | 7004 | 6884 | 6768 | 6655 | 6545 | 6437 | 6332 |
| 54 | 7381 | 7251 | 7124 | 7002 | 6882 | 6766 | 6653 | 6543 | 6435 | 6331 |
| 55 | 7378 | 7248 | 7122 | 7000 | 6880 | 6764 | 6651 | 6541 | 6434 | 6329 |
| 56 | 7376 | 7246 | 7120 | 6998 | 6878 | 6762 | 6649 | 6539 | 6432 | 6327 |
| 57 | 7374 | 7244 | 7118 | 6996 | 6877 | 6761 | 6648 | 6538 | 6430 | 6325 |
| 58 | 7372 | 7242 | 7116 | 6994 | 6875 | 6759 | 6646 | 6536 | 6428 | 6323 |
| 59 | 7370 | 7240 | 7114 | 6992 | 6873 | 6757 | 6644 | 6534 | 6426 | 6322 |
| 60 | 7368 | 7238 | 7112 | 6990 | 6871 | 6755 | 6642 | 6532 | 6425 | 6320 |



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| " | ′ 42 | ′ 43 | ′ 44 | ′ 45 | ′ 46 | ′ 47 | ′ 48 | ′ 49 | ′ 50 | ′ 51 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 6320 | 6218 | 6118 | 6021 | 5925 | 5832 | 5740 | 5651 | 5563 | 5477 |
| 1 | 6318 | 6216 | 6116 | 6019 | 5923 | 5830 | 5739 | 5649 | 5561 | 5475 |
| 2 | 6317 | 6214 | 6115 | 6017 | 5912 | 5838 | 5737 | 5648 | 5560 | 5474 |
| 3 | 6315 | 6213 | 6113 | 6016 | 5920 | 5827 | 5736 | 5646 | 5559 | 5473 |
| 4 | 6313 | 6211 | 6111 | 6014 | 5919 | 5825 | 5734 | 5645 | 5557 | 5471 |
| 5 | 6311 | 6209 | 6110 | 6012 | 5917 | 5824 | 5733 | 5643 | 5556 | 5470 |
| 6 | 6310 | 6208 | 6108 | 6011 | 5916 | 5823 | 5731 | 5642 | 5554 | 5469 |
| 7 | 6308 | 6206 | 6106 | 6009 | 5414 | 5821 | 5730 | 5640 | 5553 | 5467 |
| 8 | 6306 | 6204 | 6105 | 6008 | 5912 | 5819 | 5728 | 5639 | 5551 | 5465 |
| 9 | 6305 | 6203 | 6103 | 6006 | 5911 | 5818 | 5727 | 5637 | 5550 | 5464 |
| 10 | 6303 | 6201 | 6102 | 6004 | 5909 | 5816 | 5725 | 5636 | 5548 | 5463 |
| 11 | 6301 | 6199 | 6100 | 6003 | 5908 | 5815 | 5724 | 5634 | 5547 | 5461 |
| 12 | 6300 | 6198 | 6099 | 6001 | 5906 | 5813 | 5722 | 5633 | 5546 | 5460 |
| 13 | 6298 | 6196 | 6097 | 6000 | 5905 | 5812 | 5721 | 5631 | 5544 | 5458 |
| 14 | 6296 | 6194 | 6095 | 5998 | 5903 | 5810 | 5719 | 5630 | 5543 | 5457 |
| 15 | 6294 | 6193 | 6094 | 5997 | 5902 | 5809 | 5718 | 5629 | 5541 | 5456 |
| 16 | 6293 | 6191 | 6092 | 5995 | 5900 | 5807 | 5716 | 5627 | 5540 | 5454 |
| 17 | 6291 | 6189 | 6090 | 5993 | 5898 | 5805 | 5715 | 5626 | 5538 | 5453 |
| 18 | 6289 | 6188 | 6089 | 5992 | 5897 | 5804 | 5713 | 5624 | 5537 | 5452 |
| 19 | 6287 | 6186 | 6087 | 5990 | 5895 | 5802 | 5712 | 5623 | 5535 | 5450 |
| 20 | 6286 | 6184 | 6085 | 5988 | 5894 | 5801 | 5710 | 5621 | 5534 | 5449 |
| 21 | 6284 | 6183 | 6084 | 5987 | 5892 | 5800 | 5709 | 5620 | 5533 | 5447 |
| 22 | 6282 | 6181 | 6082 | 5985 | 5890 | 5798 | 5707 | 5618 | 5531 | 5446 |
| 23 | 6281 | 6179 | 6080 | 5984 | 5889 | 5796 | 5706 | 5617 | 5530 | 5444 |
| 24 | 6279 | 6178 | 6079 | 5982 | 5888 | 5795 | 5704 | 5615 | 5528 | 5443 |
| 25 | 6277 | 6176 | 6077 | 5980 | 5886 | 5793 | 5703 | 5614 | 5527 | 5441 |
| 26 | 6275 | 6174 | 6075 | 5979 | 5884 | 5792 | 5701 | 5612 | 5525 | 5440 |
| 27 | 6274 | 6173 | 6074 | 5977 | 5883 | 5790 | 5700 | 5611 | 5524 | 5439 |
| 28 | 6272 | 6171 | 6072 | 5976 | 5881 | 5789 | 5698 | 5609 | 5522 | 5437 |
| 29 | 6270 | 6169 | 6071 | 5974 | 5880 | 5787 | 5697 | 5608 | 5521 | 5436 |
| 30 | 6269 | 6168 | 6069 | 5973 | 5878 | 5786 | 5695 | 5607 | 5520 | 5435 |

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| " | ′ 42 | ′ 43 | ′ 44 | ′ 45 | ′ 46 | ′ 47 | ′ 48 | ′ 49 | ′ 50 | ′ 51 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 6267 | 6166 | 6067 | 5971 | 5876 | 5784 | 5694 | 5605 | 5518 | 5433 |
| 32 | 6265 | 6164 | 6066 | 5969 | 5875 | 5783 | 5693 | 5604 | 5517 | 5432 |
| 33 | 6264 | 6163 | 6064 | 5968 | 5874 | 5781 | 5691 | 5602 | 5516 | 5430 |
| 34 | 6262 | 6161 | 6062 | 5966 | 5872 | 5779 | 5689 | 5601 | 5514 | 5429 |
| 35 | 6260 | 6159 | 6061 | 5964 | 5870 | 5778 | 5688 | 5599 | 5512 | 5727 |
| 36 | 6259 | 6158 | 6059 | 5963 | 5869 | 5777 | 5686 | 5598 | 5511 | 5426 |
| 37 | 6257 | 6156 | 6058 | 5961 | 5867 | 5775 | 5685 | 5596 | 5510 | 5425 |
| 38 | 6255 | 6154 | 6056 | 5960 | 5866 | 5773 | 5683 | 5595 | 5508 | 5423 |
| 39 | 6254 | 6153 | 6055 | 5958 | 5864 | 5772 | 5682 | 5594 | 5507 | 5422 |
| 40 | 6252 | 6151 | 6053 | 5957 | 5862 | 5770 | 5680 | 5592 | 5505 | 5420 |
| 41 | 6250 | 6149 | 6051 | 5955 | 5861 | 5769 | 5679 | 5590 | 5504 | 5419 |
| 42 | 6248 | 6148 | 6050 | 5954 | 5860 | 5768 | 5677 | 5589 | 5503 | 5418 |
| 43 | 6247 | 6146 | 6048 | 5952 | 5858 | 5766 | 5676 | 5587 | 5501 | 5416 |
| 44 | 6245 | 6144 | 6046 | 5950 | 5856 | 5764 | 5674 | 5586 | 5500 | 5415 |
| 45 | 6243 | 6143 | 6045 | 5949 | 5855 | 5763 | 5673 | 5585 | 5498 | 5414 |
| 46 | 6241 | 6141 | 6043 | 5947 | 5853 | 5761 | 5671 | 5583 | 5497 | 5412 |
| 47 | 6240 | 6139 | 6041 | 5945 | 5852 | 5760 | 5670 | 5582 | 5495 | 5411 |
| 48 | 6238 | 6138 | 6040 | 5944 | 5850 | 5758 | 5669 | 5580 | 5494 | 5409 |
| 49 | 6236 | 6136 | 6038 | 5942 | 5849 | 5757 | 5667 | 5579 | 5492 | 5408 |
| 50 | 6235 | 6134 | 6037 | 5941 | 5847 | 5755 | 5665 | 5577 | 5491 | 5406 |
| 51 | 6233 | 6133 | 6035 | 5939 | 5846 | 5754 | 5664 | 5576 | 5490 | 5405 |
| 52 | 6231 | 6131 | 6033 | 5938 | 5844 | 5752 | 5662 | 5574 | 5488 | 5404 |
| 53 | 6230 | 6130 | 6032 | 5936 | 5842 | 5751 | 5661 | 5573 | 5487 | 5402 |
| 54 | 6228 | 6128 | 6030 | 5935 | 5841 | 5749 | 5660 | 5572 | 5486 | 5401 |
| 55 | 6226 | 6126 | 6028 | 5933 | 5839 | 5748 | 5658 | 5570 | 5484 | 5399 |
| 56 | 6225 | 6125 | 6027 | 5931 | 5838 | 5746 | 5656 | 5569 | 5482 | 5398 |
| 57 | 6223 | 6123 | 6025 | 5930 | 5836 | 5745 | 5655 | 5567 | 5481 | 5397 |
| 58 | 6221 | 6121 | 6024 | 5928 | 5835 | 5743 | 5654 | 5566 | 5480 | 5395 |
| 59 | 6220 | 6120 | 6022 | 5927 | 5833 | 5742 | 5652 | 5564 | 5478 | 5394 |
| 60 | 6218 | 6118 | 6021 | 5925 | 5832 | 5740 | 5651 | 5563 | 5477 | 5393 |

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| ″ | ′ 52 | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 | ′ 58 | ′ 59 | h. ° ′ 1. 0 | h. ° ′ 1. 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 5393 | 5310 | 5229 | 5149 | 5071 | 4994 | 4918 | 4844 | 4771 | 4699 |
| 1 | 5391 | 5308 | 5227 | 5148 | 5069 | 4992 | 4917 | 4843 | 4770 | 4698 |
| 2 | 5390 | 5307 | 5226 | 5146 | 5068 | 4991 | 4916 | 4842 | 4769 | 4697 |
| 3 | 5389 | 5306 | 5225 | 5145 | 5067 | 4990 | 4915 | 4841 | 4768 | 4696 |
| 4 | 5387 | 5304 | 5223 | 5144 | 5065 | 4989 | 4913 | 4839 | 4766 | 4694 |
| 5 | 5386 | 5303 | 5222 | 5142 | 5064 | 4987 | 4912 | 4838 | 4765 | 4693 |
| 6 | 5384 | 5302 | 5221 | 5141 | 5063 | 4986 | 4911 | 4837 | 4764 | 4692 |
| 7 | 5383 | 5300 | 5219 | 5140 | 5062 | 4985 | 4910 | 4835 | 4763 | 4691 |
| 8 | 5381 | 5299 | 5218 | 5138 | 5060 | 4984 | 4908 | 4834 | 4761 | 4690 |
| 9 | 5380 | 5298 | 5217 | 5137 | 5059 | 4983 | 4907 | 4833 | 4760 | 4689 |
| 10 | 5379 | 5296 | 5215 | 5136 | 5058 | 4981 | 4906 | 4832 | 4759 | 4687 |
| 11 | 5377 | 5295 | 5214 | 5134 | 5056 | 4980 | 4905 | 4831 | 4758 | 4686 |
| 12 | 5376 | 5294 | 5213 | 5133 | 5055 | 4979 | 4903 | 4830 | 4757 | 4685 |
| 13 | 5374 | 5292 | 5211 | 5132 | 5054 | 4977 | 4902 | 4828 | 4755 | 4684 |
| 14 | 5373 | 5291 | 5210 | 5130 | 5053 | 4976 | 4901 | 4827 | 4754 | 4683 |
| 15 | 5372 | 5290 | 5209 | 5129 | 5051 | 4975 | 4900 | 4826 | 4753 | 4682 |
| 16 | 5370 | 5288 | 5207 | 5128 | 5050 | 4973 | 4898 | 4824 | 4752 | 4680 |
| 17 | 5369 | 5287 | 5206 | 5127 | 5049 | 4972 | 4897 | 4823 | 4751 | 4679 |
| 18 | 5368 | 5285 | 5205 | 5125 | 5048 | 4971 | 4896 | 4822 | 4750 | 4678 |
| 19 | 5366 | 5284 | 5203 | 5124 | 5046 | 4970 | 4895 | 4821 | 4748 | 4677 |
| 20 | 5365 | 5283 | 5202 | 5123 | 5045 | 4968 | 4893 | 4820 | 4747 | 4676 |
| 21 | 5364 | 5281 | 5201 | 5122 | 5044 | 4967 | 4892 | 4819 | 4746 | 4675 |
| 22 | 5362 | 5280 | 5199 | 5120 | 5042 | 4966 | 4891 | 4817 | 4745 | 4673 |
| 23 | 5361 | 5278 | 5198 | 5119 | 5041 | 4965 | 4890 | 4816 | 4743 | 4672 |
| 24 | 5359 | 5277 | 5197 | 5118 | 5040 | 4964 | 4889 | 4815 | 4742 | 4671 |
| 25 | 5358 | 5276 | 5195 | 5116 | 5038 | 4962 | 4887 | 4813 | 4741 | 4670 |
| 26 | 5356 | 5274 | 5194 | 5115 | 5037 | 4961 | 4886 | 4812 | 4740 | 4669 |
| 27 | 5355 | 5273 | 5193 | 5114 | 5036 | 4960 | 4885 | 4811 | 4739 | 4668 |
| 28 | 5354 | 5272 | 5191 | 5112 | 5735 | 4958 | 4883 | 4810 | 4737 | 4666 |
| 29 | 5352 | 5270 | 5190 | 5111 | 5033 | 4957 | 4882 | 4809 | 4736 | 4665 |
| 30 | 5351 | 5269 | 5189 | 5110 | 5032 | 4956 | 4881 | 4808 | 4735 | 4664 |

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| ″ | 52 | ′ 53 | ′ 54 | ′ 55 | ′ 56 | ′ 57 | ′ 58 | ′ 59 | h. ° ′ 1. 0 | h. ° ′ 1. 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 5350 | 5268 | 5187 | 5108 | 5031 | 4955 | 4880 | 4806 | 4734 | 4663 |
| 32 | 5348 | 5266 | 5186 | 5107 | 5029 | 4953 | 4878 | 4805 | 4733 | 4661 |
| 33 | 5347 | 5265 | 5185 | 5106 | 5028 | 4952 | 4877 | 4804 | 4732 | 4660 |
| 34 | 5345 | 5264 | 5183 | 5104 | 5027 | 4951 | 4876 | 4802 | 4730 | 4659 |
| 35 | 5344 | 5262 | 5182 | 5103 | 5026 | 4950 | 4875 | 4801 | 4729 | 4658 |
| 36 | 5343 | 5261 | 5181 | 5102 | 5025 | 4949 | 4874 | 4800 | 4728 | 4657 |
| 37 | 5341 | 5260 | 5179 | 5100 | 5023 | 4947 | 4872 | 4799 | 4727 | 4656 |
| 38 | 5340 | 5258 | 5178 | 5099 | 5022 | 4946 | 4871 | 4798 | 4725 | 4654 |
| 39 | 5339 | 5257 | 5177 | 5098 | 5021 | 4945 | 4870 | 4797 | 4724 | 4653 |
| 40 | 5337 | 5255 | 5175 | 5097 | 5019 | 4943 | 4869 | 4795 | 4723 | 4652 |
| 41 | 5336 | 5254 | 5174 | 5095 | 5018 | 4942 | 4867 | 4794 | 4722 | 4651 |
| 42 | 5335 | 5253 | 5173 | 5094 | 5017 | 4941 | 4866 | 4793 | 4721 | 4650 |
| 43 | 5333 | 5251 | 5171 | 5093 | 5015 | 4940 | 4865 | 4792 | 4719 | 4648 |
| 44 | 5332 | 5250 | 5170 | 5091 | 5014 | 4938 | 4864 | 4790 | 4718 | 4647 |
| 45 | 5331 | 5249 | 5169 | 5090 | 5013 | 4937 | 4863 | 4789 | 4717 | 4646 |
| 46 | 5329 | 5247 | 5167 | 5089 | 5012 | 4936 | 4861 | 4788 | 4716 | 4645 |
| 47 | 5328 | 5246 | 5166 | 5087 | 5010 | 4934 | 4860 | 4787 | 4715 | 4644 |
| 48 | 5326 | 5245 | 5165 | 5086 | 5009 | 4933 | 4859 | 4786 | 4714 | 4643 |
| 49 | 5325 | 5243 | 5163 | 5085 | 5008 | 4932 | 4858 | 4784 | 4712 | 4641 |
| 50 | 5323 | 5242 | 5162 | 5084 | 5006 | 4931 | 4856 | 4783 | 4711 | 4640 |
| 51 | 5322 | 5241 | 5161 | 5082 | 5005 | 4930 | 4855 | 4782 | 4710 | 4639 |
| 52 | 5321 | 5239 | 5159 | 5081 | 5004 | 4928 | 4854 | 4781 | 4709 | 4638 |
| 53 | 5319 | 5238 | 5158 | 5080 | 5003 | 4927 | 4853 | 4779 | 4708 | 4637 |
| 54 | 5318 | 5237 | 5157 | 5079 | 5002 | 4926 | 4852 | 4778 | 4707 | 4636 |
| 55 | 5317 | 5235 | 5155 | 5077 | 5000 | 4924 | 4850 | 4777 | 4705 | 4634 |
| 56 | 5315 | 5234 | 5154 | 5076 | 4999 | 4923 | 4849 | 4776 | 4704 | 4633 |
| 57 | 5314 | 5233 | 5153 | 5075 | 4998 | 4922 | 4848 | 4775 | 4703 | 4632 |
| 58 | 5312 | 5231 | 5152 | 5073 | 4996 | 4921 | 4846 | 4773 | 4702 | 4631 |
| 59 | 5311 | 5230 | 5150 | 5072 | 4995 | 4919 | 4845 | 4772 | 4700 | 4630 |
| 60 | 5310 | 5229 | 5149 | 5071 | 4994 | 4918 | 4844 | 4771 | 4699 | 4629 |

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| " | h. ° ′ 1. 2 | h. ° ′ 1. 3 | h. ° ′ 1. 4 | h. ° ′ 1. 5 | h. ° ′ 1. 6 | h. ° ′ 1. 7 | h. ° ′ 1. 8 | h. ° ′ 1. 9 | h. ° ′ 1. 10 | h. ° ′ 1. 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4629 | 4559 | 4491 | 4424 | 4357 | 4292 | 4228 | 4164 | 4102 | 4040 |
| 1 | 4627 | 4558 | 4490 | 4422 | 4356 | 4291 | 4226 | 4163 | 4101 | 4039 |
| 2 | 4626 | 4557 | 4489 | 4421 | 4355 | 4290 | 4225 | 4162 | 4100 | 4038 |
| 3 | 4625 | 4556 | 4488 | 4420 | 4354 | 4289 | 4224 | 4161 | 4099 | 4037 |
| 4 | 4624 | 4555 | 4486 | 4419 | 4353 | 4287 | 4223 | 4160 | 4098 | 4036 |
| 5 | 4623 | 4553 | 4485 | 4418 | 4352 | 4286 | 4222 | 4159 | 4097 | 4035 |
| 6 | 4622 | 4552 | 4484 | 4417 | 4351 | 4285 | 4221 | 4158 | 4096 | 4034 |
| 7 | 4620 | 4551 | 4483 | 4416 | 4349 | 4284 | 4220 | 4157 | 4094 | 4033 |
| 8 | 4619 | 4550 | 4482 | 4415 | 4348 | 4283 | 4219 | 4156 | 4093 | 4032 |
| 9 | 4618 | 4549 | 4481 | 4414 | 4247 | 4282 | 4218 | 4155 | 4092 | 4031 |
| 10 | 4617 | 4548 | 4479 | 4412 | 4346 | 4281 | 4217 | 4154 | 4091 | 4030 |
| 11 | 4616 | 4547 | 4478 | 4411 | 4345 | 4280 | 4216 | 4153 | 4090 | 4029 |
| 12 | 4615 | 4546 | 4477 | 4410 | 4344 | 4279 | 4215 | 4152 | 4089 | 4028 |
| 13 | 4613 | 4544 | 4476 | 4409 | 4343 | 4278 | 4214 | 4151 | 4088 | 4027 |
| 14 | 4612 | 4543 | 4475 | 4408 | 4342 | 4277 | 4213 | 4150 | 4087 | 4026 |
| 15 | 4611 | 4542 | 4474 | 4407 | 4341 | 4276 | 4212 | 4149 | 4086 | 4025 |
| 16 | 4610 | 4541 | 4473 | 4406 | 4340 | 4275 | 4211 | 4147 | 4085 | 4024 |
| 17 | 4609 | 4540 | 4472 | 4405 | 4339 | 4274 | 4210 | 4146 | 4084 | 4023 |
| 18 | 4608 | 4539 | 4471 | 4404 | 4338 | 4273 | 4209 | 4145 | 4083 | 4022 |
| 19 | 4606 | 4537 | 4469 | 4402 | 4336 | 4271 | 4207 | 4144 | 4082 | 4021 |
| 20 | 4605 | 4536 | 4468 | 4401 | 4335 | 4270 | 4206 | 4143 | 4081 | 4020 |
| 21 | 4604 | 4535 | 4467 | 4400 | 4334 | 4269 | 4205 | 4142 | 4080 | 4019 |
| 22 | 4603 | 4534 | 4466 | 4399 | 4333 | 4268 | 4204 | 4141 | 4079 | 4018 |
| 23 | 4602 | 4533 | 4465 | 4398 | 4332 | 4267 | 4203 | 4140 | 4078 | 4017 |
| 24 | 4601 | 4532 | 4464 | 4397 | 4331 | 4266 | 4202 | 4139 | 4077 | 4016 |
| 25 | 4600 | 4530 | 4463 | 4396 | 4330 | 4265 | 4201 | 4138 | 4076 | 4015 |
| 26 | 4598 | 4529 | 4461 | 4395 | 4329 | 4264 | 4200 | 4137 | 4075 | 4014 |
| 27 | 4597 | 4528 | 4460 | 4394 | 4328 | 4263 | 4199 | 4136 | 4074 | 4013 |
| 28 | 4596 | 4527 | 4459 | 4392 | 4327 | 4262 | 4198 | 4135 | 4073 | 4012 |
| 29 | 4595 | 4526 | 4458 | 4391 | 4326 | 4261 | 4197 | 4134 | 4072 | 4011 |
| 30 | 4594 | 4525 | 4457 | 4390 | 4325 | 4260 | 4196 | 4133 | 4071 | 4010 |

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| " | h. ° ′ 1. 2 | h. ° ′ 1. 3 | h. ° ′ 1. 4 | h. ° ′ 1. 5 | h. ° ′ 1. 6 | h. ° ′ 1. 7 | h. ° ′ 1. 8 | h. ° ′ 1. 9 | h. ° 1. 10 | h. ° ′ 1. 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 4593 | 4524 | 4456 | 4389 | 4323 | 4258 | 4195 | 4132 | 4070 | 4009 |
| 32 | 4591 | 4523 | 4455 | 4388 | 4322 | 4257 | 4194 | 4131 | 4069 | 4008 |
| 33 | 4590 | 4522 | 4454 | 4387 | 4321 | 4256 | 4193 | 4130 | 4068 | 4007 |
| 34 | 4589 | 4520 | 4452 | 4386 | 4320 | 4255 | 4191 | 4129 | 4067 | 4006 |
| 35 | 4588 | 4519 | 4451 | 4385 | 4319 | 4254 | 4190 | 4128 | 4066 | 4005 |
| 36 | 4587 | 4518 | 4450 | 4384 | 4318 | 4253 | 4189 | 4127 | 4065 | 4004 |
| 37 | 4586 | 4517 | 4449 | 4382 | 4317 | 4252 | 4188 | 4126 | 4064 | 4003 |
| 38 | 4585 | 4516 | 4448 | 4381 | 4316 | 4251 | 4187 | 4125 | 4063 | 4002 |
| 39 | 4584 | 4515 | 4447 | 4380 | 4315 | 4250 | 4186 | 4124 | 4062 | 4001 |
| 40 | 4582 | 4513 | 4446 | 4379 | 4313 | 4249 | 4185 | 4122 | 4061 | 4000 |
| 41 | 4581 | 4512 | 4445 | 4378 | 4312 | 4248 | 4184 | 4121 | 4060 | 3999 |
| 42 | 4580 | 4511 | 4444 | 4377 | 4311 | 4247 | 4183 | 4120 | 4059 | 3998 |
| 43 | 4579 | 4510 | 4442 | 4376 | 4310 | 4246 | 4182 | 4119 | 4057 | 3997 |
| 44 | 4578 | 4509 | 4441 | 4375 | 4309 | 4245 | 4181 | 4118 | 4056 | 3996 |
| 45 | 4577 | 4508 | 4440 | 4374 | 4308 | 4244 | 4180 | 4117 | 4055 | 3995 |
| 46 | 4575 | 4507 | 4439 | 4372 | 4307 | 4242 | 4179 | 4116 | 4054 | 3993 |
| 47 | 4574 | 4506 | 4438 | 4371 | 4306 | 4241 | 4178 | 4115 | 4053 | 3992 |
| 48 | 4573 | 4505 | 4437 | 4370 | 4305 | 4240 | 4177 | 4114 | 4052 | 3991 |
| 49 | 4572 | 4503 | 4436 | 4369 | 4304 | 4239 | 4176 | 4113 | 4051 | 3990 |
| 50 | 4571 | 4502 | 4435 | 4368 | 4303 | 4238 | 4175 | 4112 | 4050 | 3989 |
| 51 | 4570 | 4501 | 4434 | 4367 | 4302 | 4237 | 4174 | 4111 | 4049 | 3988 |
| 52 | 4568 | 4500 | 4432 | 4366 | 4300 | 4236 | 4173 | 4110 | 4048 | 3987 |
| 53 | 4567 | 4499 | 4431 | 4365 | 4299 | 4235 | 4172 | 4109 | 4047 | 3986 |
| 54 | 4566 | 4498 | 4430 | 4364 | 4298 | 4234 | 4171 | 4108 | 4046 | 3985 |
| 55 | 4565 | 4496 | 4429 | 4363 | 4297 | 4233 | 4169 | 4107 | 4045 | 3984 |
| 56 | 4564 | 4595 | 4428 | 4362 | 4296 | 4232 | 4168 | 4106 | 4044 | 3983 |
| 57 | 4563 | 4494 | 4427 | 4361 | 4295 | 4231 | 4167 | 4105 | 4043 | 3982 |
| 58 | 4561 | 4493 | 4426 | 4359 | 4294 | 4230 | 4166 | 4104 | 4042 | 3981 |
| 59 | 4560 | 4492 | 4425 | 4358 | 4293 | 4229 | 4165 | 4103 | 4041 | 3980 |
| 60 | 4559 | 4491 | 4424 | 4357 | 4292 | 4228 | 4164 | 4102 | 4040 | 3979 |



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| ″ | h. ° ′ 1. 12 | h. ° ′ 1. 13 | h. ° ′ 1. 14 | h. ° ′ 1. 15 | h. ° ′ 1. 16 | h. ° ′ 1. 17 | h. ° ′ 1. 18 | h. ° ′ 1. 19 | h. ° ′ 1. 20 | h. ° ′ 1. 21 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3979 | 3919 | 3860 | 3802 | 3745 | 3688 | 3632 | 3576 | 3522 | 3468 |
| 1 | 3978 | 3918 | 3859 | 3801 | 3744 | 3687 | 3631 | 3575 | 3521 | 3467 |
| 2 | 3977 | 3917 | 3858 | 3800 | 3743 | 3686 | 3630 | 3574 | 3520 | 3466 |
| 3 | 3976 | 3917 | 3857 | 3799 | 3742 | 3685 | 3629 | 3574 | 3519 | 3465 |
| 4 | 3975 | 3916 | 3856 | 3798 | 3741 | 3684 | 3628 | 3573 | 3518 | 3464 |
| 5 | 3974 | 3915 | 3855 | 3797 | 3740 | 3683 | 3627 | 3572 | 3517 | 3463 |
| 6 | 3973 | 3914 | 3855 | 3796 | 3739 | 3682 | 3626 | 3571 | 3516 | 3463 |
| 7 | 3972 | 3913 | 3854 | 3795 | 3738 | 3681 | 3625 | 3570 | 3515 | 3462 |
| 8 | 3971 | 3912 | 3853 | 3794 | 3737 | 3680 | 3624 | 3569 | 3514 | 3461 |
| 9 | 3970 | 3911 | 3852 | 3793 | 3736 | 3679 | 3623 | 3568 | 3514 | 3460 |
| 10 | 3969 | 3910 | 3851 | 3792 | 3735 | 3678 | 3622 | 3567 | 3513 | 3459 |
| 11 | 3968 | 3909 | 3850 | 3791 | 3734 | 3677 | 3621 | 3566 | 3512 | 3458 |
| 12 | 3967 | 3908 | 3849 | 3791 | 3733 | 3677 | 3621 | 3565 | 3511 | 3457 |
| 13 | 3966 | 3907 | 3848 | 3790 | 3732 | 3676 | 3620 | 3564 | 3510 | 3456 |
| 14 | 3965 | 3906 | 3847 | 3789 | 3731 | 3675 | 3619 | 3563 | 3509 | 3455 |
| 15 | 3964 | 3905 | 3846 | 3788 | 3730 | 3674 | 3618 | 3563 | 3508 | 3454 |
| 16 | 3963 | 3904 | 3845 | 3787 | 3729 | 3673 | 3617 | 3562 | 3507 | 3454 |
| 17 | 3962 | 3903 | 3844 | 3786 | 3728 | 3672 | 3616 | 3561 | 3506 | 3453 |
| 18 | 3961 | 3902 | 3843 | 3785 | 3727 | 3671 | 3615 | 3560 | 3506 | 3452 |
| 19 | 3960 | 3901 | 3842 | 3784 | 3726 | 3670 | 3614 | 3559 | 3505 | 3451 |
| 20 | 3959 | 3900 | 3841 | 3783 | 3725 | 3669 | 3613 | 3558 | 3504 | 3450 |
| 21 | 3958 | 3899 | 3840 | 3782 | 3725 | 3668 | 3612 | 3557 | 3503 | 3449 |
| 22 | 3957 | 3898 | 3839 | 3781 | 3724 | 3667 | 3611 | 3556 | 3502 | 3448 |
| 23 | 3956 | 3897 | 3838 | 3780 | 3723 | 3666 | 3610 | 3555 | 3501 | 3447 |
| 24 | 3955 | 3896 | 3837 | 3779 | 3722 | 3665 | 3610 | 3555 | 3500 | 3446 |
| 25 | 3954 | 3895 | 3836 | 3778 | 3721 | 3664 | 3609 | 3554 | 3499 | 3445 |
| 26 | 3953 | 3894 | 3835 | 3777 | 3720 | 3663 | 3608 | 3553 | 3498 | 3445 |
| 27 | 3952 | 3893 | 3834 | 3776 | 3719 | 3663 | 3607 | 3552 | 3497 | 3444 |
| 28 | 3951 | 3892 | 3833 | 3775 | 3718 | 3662 | 3606 | 3551 | 3496 | 3443 |
| 29 | 3950 | 3891 | 3832 | 3774 | 3717 | 3661 | 3605 | 3550 | 3496 | 3442 |
| 30 | 3949 | 3890 | 3831 | 3773 | 3716 | 3660 | 3604 | 3549 | 3495 | 3441 |

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| ″ | h. ° ′ 1. 12 | h. ° ′ 1. 13 | h. ° ′ 1. 14 | h. ° ′ 1. 15 | h. ° ′ 1. 16 | h. ° ′ 1. 17 | h. ° ′ 1. 18 | h. ° ′ 1. 19 | h. ° ′ 1. 20 | h. ° ′ 1. 21 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 3948 | 3889 | 3830 | 3772 | 3715 | 3659 | 3603 | 3548 | 3494 | 3440 |
| 32 | 3947 | 3888 | 3829 | 3771 | 3714 | 3658 | 3602 | 3547 | 3493 | 3439 |
| 33 | 3946 | 3887 | 3828 | 3770 | 3713 | 3657 | 3601 | 3546 | 3492 | 3438 |
| 34 | 3945 | 3886 | 3827 | 3769 | 3712 | 3656 | 3600 | 3545 | 3491 | 3438 |
| 35 | 3944 | 3885 | 3826 | 3768 | 3711 | 3655 | 3599 | 3544 | 3490 | 3437 |
| 36 | 3943 | 3884 | 3825 | 3768 | 3710 | 3654 | 3598 | 3544 | 3489 | 3436 |
| 37 | 3942 | 3883 | 3824 | 3767 | 3709 | 3653 | 3597 | 3543 | 3488 | 3435 |
| 38 | 3941 | 3882 | 3823 | 3766 | 3708 | 3652 | 3596 | 3542 | 3487 | 3434 |
| 39 | 3940 | 3881 | 3822 | 3765 | 3708 | 3651 | 3596 | 3541 | 3487 | 3433 |
| 40 | 3939 | 3880 | 3821 | 3764 | 3707 | 3650 | 3595 | 3540 | 3486 | 3432 |
| 41 | 3938 | 3879 | 3820 | 3763 | 3706 | 3649 | 3594 | 3539 | 3485 | 3431 |
| 42 | 3937 | 3878 | 3820 | 3762 | 3705 | 3649 | 3593 | 3538 | 3484 | 3431 |
| 43 | 3936 | 3877 | 3819 | 3761 | 3704 | 3648 | 3592 | 3537 | 3483 | 3430 |
| 44 | 3935 | 3876 | 3818 | 3760 | 3703 | 3647 | 3591 | 3536 | 3482 | 3429 |
| 45 | 3934 | 3875 | 3817 | 3759 | 3702 | 3646 | 3590 | 3535 | 3481 | 3428 |
| 46 | 3933 | 3874 | 3816 | 3758 | 3701 | 3645 | 3589 | 3534 | 3480 | 3427 |
| 47 | 3932 | 3873 | 3815 | 3757 | 3700 | 3644 | 3588 | 3533 | 3479 | 3426 |
| 48 | 3931 | 3872 | 3814 | 3756 | 3699 | 3643 | 3587 | 3533 | 3479 | 3425 |
| 49 | 3930 | 3871 | 3813 | 3755 | 3698 | 3642 | 3586 | 3532 | 3478 | 3424 |
| 50 | 3929 | 3870 | 3812 | 3754 | 3697 | 3641 | 3585 | 3531 | 3477 | 3423 |
| 51 | 3928 | 3869 | 3811 | 3753 | 3696 | 3640 | 3585 | 3530 | 3476 | 3423 |
| 52 | 3927 | 3868 | 3810 | 3752 | 3695 | 3639 | 3584 | 3529 | 3475 | 3422 |
| 53 | 3926 | 3867 | 3809 | 3751 | 3694 | 3638 | 3583 | 3528 | 3474 | 3421 |
| 54 | 3925 | 3866 | 3808 | 3750 | 3693 | 3637 | 3582 | 3527 | 3473 | 3420 |
| 55 | 3924 | 3865 | 3807 | 3749 | 3692 | 3636 | 3581 | 3526 | 3472 | 3419 |
| 56 | 3923 | 3864 | 3806 | 3748 | 3691 | 3635 | 3580 | 3525 | 3471 | 3418 |
| 57 | 3922 | 3863 | 3805 | 3747 | 3691 | 3635 | 3579 | 3525 | 3471 | 3417 |
| 58 | 3921 | 3862 | 3804 | 3746 | 3690 | 3634 | 3578 | 3524 | 3470 | 3416 |
| 59 | 3920 | 3861 | 3803 | 3745 | 3689 | 3633 | 3577 | 3523 | 3469 | 3415 |
| 60 | 3919 | 3860 | 3802 | 3745 | 3688 | 3632 | 3576 | 3522 | 3468 | 3415 |



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| " | h. ° ' 1. 22 | h. ° ' 1. 23 | h. ° ' 1. 24 | h. ° ' 1. 25 | h. ° ' 1. 26 | h. ° ' 1. 27 | h. ° ' 1. 28 | h. ° ' 1. 29 | h ° ' 1. 30 | h. ° ' 1. 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3415 | 3362 | 3310 | 3259 | 3208 | 3158 | 3108 | 3059 | 3010 | 2962 |
| 1 | 3414 | 3361 | 3309 | 3258 | 3207 | 3157 | 3107 | 3058 | 3009 | 2961 |
| 2 | 3413 | 3360 | 3308 | 3257 | 3206 | 3156 | 3106 | 3057 | 3009 | 2961 |
| 3 | 3412 | 3359 | 3307 | 3256 | 3205 | 3155 | 3105 | 3056 | 3008 | 2960 |
| 4 | 3411 | 3358 | 3306 | 3255 | 3204 | 3154 | 3105 | 3056 | 3007 | 2959 |
| 5 | 3410 | 3358 | 3306 | 3254 | 3203 | 3153 | 3104 | 3055 | 3006 | 2958 |
| 6 | 3409 | 3357 | 3305 | 3253 | 3203 | 3153 | 3103 | 3054 | 3005 | 2958 |
| 7 | 3408 | 3356 | 3304 | 3253 | 3202 | 3152 | 3102 | 3053 | 3005 | 2957 |
| 8 | 3407 | 3355 | 3303 | 3252 | 3201 | 3151 | 3101 | 3052 | 3004 | 2956 |
| 9 | 3407 | 3354 | 3302 | 3251 | 3200 | 3150 | 3101 | 3052 | 3003 | 2955 |
| 10 | 3406 | 3353 | 3301 | 3250 | 3199 | 3149 | 3100 | 3051 | 3002 | 2954 |
| 11 | 3405 | 3352 | 3300 | 3249 | 3198 | 3148 | 3099 | 5050 | 3001 | 2954 |
| 12 | 3404 | 3351 | 3300 | 3248 | 3198 | 3148 | 3098 | 3049 | 3001 | 2953 |
| 13 | 3403 | 3351 | 3299 | 3247 | 3197 | 3147 | 3097 | 3048 | 3000 | 2952 |
| 14 | 3402 | 3350 | 3298 | 3247 | 3196 | 3146 | 3096 | 3047 | 2999 | 2951 |
| 15 | 3401 | 3349 | 3297 | 3246 | 3195 | 3145 | 3096 | 3047 | 2998 | 2950 |
| 16 | 3400 | 3348 | 3296 | 3245 | 3194 | 3144 | 3095 | 3046 | 2997 | 2950 |
| 17 | 3400 | 3347 | 3295 | 3244 | 3193 | 3143 | 3094 | 3045 | 2997 | 2949 |
| 18 | 3399 | 3346 | 3294 | 3243 | 3193 | 3143 | 3093 | 3044 | 2996 | 2948 |
| 19 | 3398 | 3345 | 3294 | 3242 | 3192 | 3142 | 3092 | 3043 | 2995 | 2947 |
| 20 | 3397 | 3344 | 3293 | 3241 | 3191 | 3141 | 3091 | 3043 | 2994 | 2946 |
| 21 | 3396 | 3344 | 3292 | 3241 | 3190 | 3140 | 3091 | 3042 | 2993 | 2946 |
| 22 | 3395 | 3343 | 3291 | 3240 | 3189 | 3139 | 3090 | 3041 | 2993 | 2945 |
| 23 | 3394 | 3342 | 3290 | 3239 | 3188 | 3138 | 3089 | 3040 | 2992 | 2944 |
| 24 | 3393 | 3341 | 3289 | 3238 | 3188 | 3138 | 3088 | 3039 | 2991 | 2943 |
| 25 | 3393 | 3340 | 3288 | 3237 | 3187 | 3137 | 3087 | 3038 | 2990 | 2942 |
| 26 | 3392 | 3339 | 3287 | 3236 | 3186 | 3136 | 3686 | 3038 | 2989 | 2942 |
| 27 | 3391 | 3338 | 3287 | 3236 | 3185 | 3135 | 3086 | 3037 | 2989 | 2941 |
| 28 | 3390 | 3338 | 3286 | 3235 | 3184 | 3134 | 3085 | 3036 | 2988 | 2940 |
| 29 | 3389 | 3337 | 3285 | 3234 | 3183 | 3133 | 3084 | 3035 | 2987 | 2939 |
| 30 | 3388 | 3336 | 3284 | 3233 | 3183 | 3133 | 3083 | 3034 | 2986 | 2939 |

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| ″ | h. ° ′ 1. 22 | h. ° ′ 1. 23 | h ° ′ 1. 24 | h ° ′ 1. 25 | h. ° ′ 1. 26 | h. ° ′ 1. 27 | h ° ′ 1. 28 | h. ° ′ 1. 29 | h. ° ′ 1. 30 | h. ° ′ 1. 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 3387 | 3335 | 3283 | 3232 | 3182 | 3132 | 3082 | 3034 | 2985 | 2938 |
| 32 | 3386 | 3334 | 3282 | 3231 | 3181 | 3131 | 3082 | 3033 | 2985 | 2937 |
| 33 | 3386 | 3333 | 3282 | 3231 | 3180 | 3130 | 3081 | 3032 | 2984 | 2936 |
| 34 | 3385 | 3332 | 3281 | 3230 | 3179 | 3129 | 3080 | 3031 | 2983 | 2935 |
| 35 | 3384 | 3331 | 3280 | 3229 | 3178 | 3128 | 3079 | 3030 | 2982 | 2934 |
| 36 | 3383 | 3331 | 3279 | 3228 | 3178 | 3128 | 3078 | 3030 | 2981 | 2934 |
| 37 | 3382 | 3330 | 3278 | 3227 | 3177 | 3127 | 3078 | 3029 | 2981 | 2933 |
| 38 | 3381 | 3329 | 3277 | 3226 | 3176 | 3126 | 3077 | 3028 | 2980 | 2932 |
| 39 | 3380 | 3328 | 3276 | 3225 | 3175 | 3125 | 3076 | 3027 | 2979 | 2931 |
| 40 | 3379 | 3327 | 3276 | 3225 | 3174 | 3124 | 3075 | 3026 | 2978 | 2931 |
| 41 | 3378 | 3326 | 3275 | 3224 | 3173 | 3123 | 3074 | 3026 | 2977 | 2930 |
| 42 | 3378 | 3325 | 3274 | 3223 | 3173 | 3123 | 3073 | 3025 | 2977 | 2929 |
| 43 | 3377 | 3325 | 3273 | 3222 | 3172 | 3122 | 3073 | 3024 | 2976 | 2928 |
| 44 | 3376 | 3324 | 3272 | 3221 | 3171 | 3121 | 3072 | 3023 | 2975 | 2927 |
| 45 | 3375 | 3323 | 3271 | 3220 | 3170 | 3120 | 3071 | 3022 | 2974 | 2927 |
| 46 | 3374 | 3322 | 3270 | 3219 | 3169 | 3119 | 3070 | 3022 | 2973 | 2926 |
| 47 | 3373 | 3321 | 3270 | 3219 | 3168 | 3119 | 3069 | 3021 | 2973 | 2925 |
| 48 | 3372 | 3320 | 3269 | 3218 | 3168 | 3118 | 3069 | 3020 | 2972 | 2924 |
| 49 | 3371 | 3319 | 3268 | 3217 | 3167 | 3117 | 3068 | 3019 | 3971 | 2923 |
| 50 | 3371 | 3318 | 3267 | 3216 | 3166 | 3116 | 3067 | 3018 | 2970 | 2923 |
| 51 | 3370 | 3318 | 3266 | 3215 | 3165 | 3115 | 3066 | 3018 | 2969 | 2922 |
| 52 | 3369 | 3317 | 2365 | 3214 | 3164 | 3114 | 3065 | 3017 | 2969 | 2921 |
| 53 | 3368 | 3316 | 3264 | 3214 | 3163 | 3114 | 3064 | 3016 | 2968 | 2920 |
| 54 | 3367 | 3315 | 3264 | 3213 | 3163 | 3113 | 3064 | 3015 | 2967 | 2920 |
| 55 | 3366 | 3314 | 3263 | 3212 | 3162 | 3112 | 3063 | 3014 | 2966 | 2919 |
| 56 | 3365 | 3313 | 3262 | 3211 | 3161 | 3111 | 3062 | 3013 | 2965 | 2918 |
| 57 | 3365 | 3313 | 3261 | 3210 | 3160 | 3110 | 3061 | 3013 | 2965 | 2917 |
| 58 | 3364 | 3312 | 3260 | 3209 | 3159 | 3109 | 3060 | 3012 | 2964 | 2916 |
| 59 | 3363 | 3311 | 3259 | 3209 | 3158 | 3109 | 3060 | 3011 | 2963 | 2916 |
| 60 | 3362 | 3310 | 3259 | 3208 | 3158 | 3108 | 3059 | 3010 | 2962 | 2915 |

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| " | h. ° ' 1. 32 | h. ° ' 1. 33 | h. ° ' 1. 34 | h. ° ' 1. 35 | h. ° ' 1. 36 | h. ° ' 1. 37 | h. ° ' 1. 38 | h. ° ' 1. 39 | h. ° ' 1. 40 | h. ° ' 1. 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2915 | 2868 | 2821 | 2775 | 2730 | 2685 | 2640 | 2596 | 2553 | 2510 |
| 1 | 2914 | 2867 | 2821 | 2775 | 2729 | 2684 | 2640 | 2596 | 2552 | 2509 |
| 2 | 2913 | 2866 | 2820 | 2774 | 2728 | 2683 | 2639 | 2595 | 2551 | 2508 |
| 3 | 2912 | 2866 | 2819 | 2773 | 2728 | 2683 | 2638 | 2594 | 2551 | 2507 |
| 4 | 2912 | 2865 | 2818 | 2772 | 2727 | 2682 | 2637 | 2593 | 2550 | 2507 |
| 5 | 2911 | 2864 | 2818 | 2772 | 2726 | 2681 | 2637 | 2593 | 2549 | 2506 |
| 6 | 2910 | 2863 | 2817 | 2771 | 2725 | 2681 | 2636 | 2592 | 2548 | 2505 |
| 7 | 2909 | 2862 | 2816 | 2770 | 2725 | 2680 | 2635 | 2591 | 2548 | 2504 |
| 8 | 2908 | 2862 | 2815 | 2769 | 2724 | 2679 | 2634 | 2590 | 2547 | 2504 |
| 9 | 2908 | 2861 | 2815 | 2769 | 2723 | 2678 | 2634 | 2590 | 2546 | 2503 |
| 10 | 2907 | 2860 | 2814 | 2768 | 2722 | 2678 | 2633 | 2589 | 2545 | 2502 |
| 11 | 2906 | 2859 | 2813 | 2767 | 2722 | 2677 | 2632 | 2588 | 2545 | 2502 |
| 12 | 2905 | 2859 | 2812 | 2766 | 2721 | 2676 | 2632 | 2588 | 2544 | 2501 |
| 13 | 2905 | 2858 | 2811 | 2766 | 2720 | 2675 | 2631 | 2587 | 2543 | 2500 |
| 14 | 2904 | 2857 | 2811 | 2765 | 2719 | 2675 | 2630 | 2586 | 2543 | 2499 |
| 15 | 2903 | 2856 | 2810 | 2764 | 2719 | 2674 | 2629 | 2585 | 2542 | 2499 |
| 16 | 2902 | 2855 | 2809 | 2763 | 2718 | 2673 | 2629 | 2585 | 2541 | 2498 |
| 17 | 2901 | 2855 | 2808 | 2762 | 2717 | 2672 | 2628 | 2584 | 2540 | 2497 |
| 18 | 2901 | 2854 | 2808 | 2762 | 2716 | 2672 | 2627 | 2583 | 2540 | 2497 |
| 19 | 2900 | 2853 | 2807 | 2761 | 2716 | 2671 | 2626 | 2582 | 2539 | 2496 |
| 20 | 2899 | 2852 | 2806 | 2760 | 2715 | 2670 | 2626 | 2582 | 2538 | 2495 |
| 21 | 2898 | 2852 | 2805 | 2760 | 2714 | 2669 | 2625 | 2581 | 2538 | 2494 |
| 22 | 2898 | 2851 | 2804 | 2759 | 2713 | 2669 | 2624 | 2580 | 2537 | 2494 |
| 23 | 2897 | 2850 | 2804 | 2758 | 2713 | 2668 | 2623 | 2580 | 2536 | 2493 |
| 24 | 2896 | 2849 | 2803 | 2757 | 2712 | 2667 | 2623 | 2579 | 2535 | 2492 |
| 25 | 2895 | 2848 | 2802 | 2756 | 2711 | 2666 | 2622 | 2578 | 2535 | 2492 |
| 26 | 2894 | 2848 | 2801 | 2756 | 2710 | 2666 | 2621 | 2577 | 2534 | 2491 |
| 27 | 2894 | 2847 | 2801 | 2755 | 2710 | 2665 | 2621 | 2577 | 2533 | 2490 |
| 28 | 2893 | 2846 | 2800 | 2754 | 2709 | 2664 | 2620 | 2576 | 2532 | 2489 |
| 29 | 2892 | 2845 | 2799 | 2753 | 2708 | 2663 | 2619 | 2575 | 2532 | 2489 |
| 30 | 2891 | 2845 | 2798 | 2753 | 2707 | 2663 | 2618 | 2574 | 2531 | 2488 |

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| " | h. 1. 32 | h. 1. 33 | h. 1. 34 | h. 1. 35 | h. 1. 36 | h. 1. 37 | h. 1. 38 | h. 1. 39 | h. 1. 40 | h. 1. 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 2890 | 2844 | 2798 | 2752 | 2707 | 2662 | 2618 | 2574 | 2530 | 2487 |
| 32 | 2890 | 2843 | 2797 | 2751 | 2706 | 2661 | 2617 | 2573 | 2530 | 2487 |
| 33 | 2889 | 2842 | 2796 | 2750 | 2705 | 2660 | 2616 | 2572 | 2529 | 2486 |
| 34 | 2888 | 2841 | 2795 | 2750 | 2704 | 2660 | 2615 | 2572 | 2528 | 2485 |
| 35 | 2887 | 2841 | 2795 | 2749 | 2704 | 2659 | 2615 | 2571 | 2527 | 2484 |
| 36 | 2887 | 2840 | 2794 | 2748 | 2703 | 2658 | 2614 | 2570 | 2527 | 2484 |
| 37 | 2886 | 2839 | 2793 | 2747 | 2702 | 2657 | 2613 | 2569 | 2526 | 2483 |
| 38 | 2885 | 2838 | 2792 | 2747 | 2701 | 2657 | 2612 | 2569 | 2525 | 2482 |
| 39 | 2884 | 2838 | 2792 | 2746 | 2701 | 2656 | 2612 | 2568 | 2525 | 2482 |
| 40 | 2883 | 2837 | 2791 | 2745 | 2700 | 2655 | 2611 | 2567 | 2524 | 2481 |
| 41 | 2883 | 2836 | 2790 | 2744 | 2699 | 2654 | 2610 | 2566 | 2523 | 2480 |
| 42 | 2882 | 2835 | 2789 | 2744 | 2698 | 2654 | 2610 | 2566 | 2522 | 2480 |
| 43 | 2881 | 2834 | 2788 | 2743 | 2698 | 2653 | 2609 | 2565 | 2522 | 2479 |
| 44 | 2880 | 2834 | 2788 | 2742 | 2697 | 2652 | 2608 | 2564 | 2521 | 2478 |
| 45 | 2880 | 2833 | 2787 | 2741 | 2696 | 2652 | 2607 | 2564 | 2520 | 2477 |
| 46 | 2879 | 2832 | 2786 | 2741 | 2695 | 2651 | 2607 | 2563 | 2520 | 2477 |
| 47 | 2878 | 2831 | 2785 | 2740 | 2695 | 2650 | 2606 | 2562 | 2519 | 2476 |
| 48 | 2877 | 2831 | 2785 | 2739 | 2694 | 2649 | 2605 | 2561 | 2518 | 2475 |
| 49 | 2876 | 2830 | 2784 | 2738 | 2693 | 2649 | 2604 | 2561 | 2517 | 2474 |
| 50 | 2876 | 2829 | 2783 | 2737 | 2692 | 2648 | 2604 | 2560 | 2517 | 2474 |
| 51 | 2875 | 2828 | 2782 | 2737 | 2692 | 2647 | 2603 | 2559 | 2516 | 2473 |
| 52 | 2874 | 2828 | 2782 | 2736 | 2691 | 2646 | 2602 | 2558 | 2515 | 2472 |
| 53 | 2873 | 2827 | 2781 | 2735 | 2690 | 2646 | 2601 | 2558 | 2514 | 2472 |
| 54 | 2873 | 2826 | 2780 | 2735 | 2689 | 2645 | 2601 | 2557 | 2514 | 2471 |
| 55 | 2872 | 2825 | 2779 | 2734 | 2689 | 2644 | 2600 | 2556 | 2513 | 2470 |
| 56 | 2871 | 2824 | 2778 | 2733 | 2688 | 2643 | 2599 | 2556 | 2512 | 2470 |
| 57 | 2870 | 2824 | 2778 | 2732 | 2687 | 2643 | 2599 | 2555 | 2512 | 2469 |
| 58 | 2869 | 2823 | 2777 | 2731 | 2686 | 2642 | 2598 | 2554 | 2511 | 2468 |
| 59 | 2869 | 2822 | 2776 | 2731 | 2686 | 2641 | 2597 | 2553 | 2510 | 2467 |
| 60 | 2868 | 2821 | 2775 | 2730 | 2685 | 2640 | 2596 | 2553 | 2510 | 2467 |

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|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2467 | 2424 | 2382 | 2341 | 2300 | 2259 | 2218 | 2178 | 2139 | 2099 |
| 1 | 2466 | 2424 | 2382 | 2340 | 2299 | 2258 | 2218 | 2178 | 2138 | 2099 |
| 2 | 2465 | 2423 | 2381 | 2339 | 2298 | 2257 | 2217 | 2177 | 2137 | 2098 |
| 3 | 2465 | 2422 | 2380 | 2339 | 2998 | 2257 | 2216 | 2176 | 2137 | 2098 |
| 4 | 2464 | 2421 | 2380 | 2338 | 2297 | 2256 | 2216 | 2176 | 2136 | 2097 |
| 5 | 2463 | 2421 | 2379 | 2337 | 2296 | 2255 | 2215 | 2175 | 2135 | 2096 |
| 6 | 2462 | 2420 | 2378 | 2337 | 2296 | 2255 | 2214 | 2174 | 2135 | 2096 |
| 7 | 2462 | 2419 | 2378 | 2336 | 2295 | 2254 | 2214 | 2174 | 2134 | 2095 |
| 8 | 2461 | 2419 | 2377 | 2335 | 2294 | 2253 | 2213 | 2173 | 2133 | 2094 |
| 9 | 2460 | 2418 | 2376 | 2335 | 2294 | 2253 | 2212 | 2172 | 2133 | 2094 |
| 10 | 2460 | 2417 | 2375 | 2334 | 2293 | 2252 | 2212 | 2172 | 2132 | 2093 |
| 11 | 2459 | 2417 | 2375 | 2333 | 2292 | 2251 | 2211 | 2171 | 2132 | 2092 |
| 12 | 2458 | 2416 | 2374 | 2333 | 2291 | 2251 | 2210 | 2170 | 2131 | 2092 |
| 13 | 2457 | 2415 | 2373 | 2332 | 2291 | 2250 | 2210 | 2170 | 2130 | 2091 |
| 14 | 2457 | 2414 | 2373 | 2331 | 2290 | 2249 | 2209 | 2169 | 2130 | 2090 |
| 15 | 2456 | 2414 | 2372 | 2331 | 2289 | 2249 | 2208 | 2169 | 2129 | 2090 |
| 16 | 2455 | 2413 | 2371 | 2330 | 2289 | 2248 | 2208 | 2168 | 2128 | 2089 |
| 17 | 2455 | 2412 | 2371 | 2329 | 2288 | 2247 | 2207 | 2167 | 2128 | 2088 |
| 18 | 2454 | 2412 | 2370 | 2328 | 2287 | 2247 | 2206 | 2167 | 2127 | 2088 |
| 19 | 2453 | 2411 | 2369 | 2328 | 2287 | 2246 | 2206 | 2166 | 2126 | 2087 |
| 20 | 2452 | 2410 | 2368 | 2327 | 2286 | 2245 | 2205 | 2165 | 2126 | 2086 |
| 21 | 2452 | 2410 | 2368 | 2326 | 2285 | 2245 | 2204 | 2165 | 2125 | 2086 |
| 22 | 2451 | 2409 | 2367 | 2326 | 2285 | 2244 | 2204 | 2164 | 2124 | 2085 |
| 23 | 2450 | 2408 | 2366 | 2325 | 2284 | 2243 | 2203 | 2163 | 2124 | 2084 |
| 24 | 2450 | 2408 | 2366 | 2324 | 2283 | 2243 | 2202 | 2163 | 2123 | 2084 |
| 25 | 2449 | 2407 | 2365 | 2324 | 2283 | 2242 | 2202 | 2162 | 2122 | 2083 |
| 26 | 2448 | 2406 | 2364 | 2323 | 2282 | 2241 | 2201 | 2161 | 2122 | 2083 |
| 27 | 2448 | 2405 | 2364 | 2322 | 2281 | 2241 | 2200 | 2161 | 2121 | 2082 |
| 28 | 2447 | 2405 | 2363 | 2322 | 2281 | 2240 | 2200 | 2160 | 2120 | 2081 |
| 29 | 2446 | 2404 | 2362 | 2321 | 2280 | 2239 | 2199 | 2159 | 2120 | 2081 |
| 30 | 2445 | 2403 | 2362 | 2320 | 2279 | 2239 | 2198 | 2159 | 2119 | 2080 |

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| " | h ° ′ 1.42 | h ° ′ 1.43 | h ° ′ 1.44 | h ° ′ 1.45 | h ° ′ 1.46 | h ° ′ 1.47 | h ° ′ 1.48 | h ° ′ 1.49 | h ° ′ 1.50 | h ° ′ 1.51 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 2445 | 2403 | 2361 | 2319 | 2279 | 2238 | 2198 | 2158 | 2118 | 2079 |
| 32 | 2444 | 2402 | 2360 | 2319 | 2278 | 2237 | 2197 | 2157 | 2118 | 2079 |
| 33 | 2443 | 2401 | 2359 | 2318 | 2277 | 2237 | 2196 | 2157 | 2117 | 2078 |
| 34 | 2443 | 2400 | 2359 | 2317 | 2276 | 2236 | 2196 | 2156 | 2116 | 2077 |
| 35 | 2442 | 2400 | 2358 | 2317 | 2276 | 2235 | 2195 | 2155 | 2116 | 2077 |
| 36 | 2441 | 2399 | 2357 | 2316 | 2275 | 2235 | 2194 | 2155 | 2115 | 2076 |
| 37 | 2440 | 2398 | 2357 | 2315 | 2274 | 2234 | 2194 | 2154 | 2114 | 2075 |
| 38 | 2440 | 2398 | 2356 | 2315 | 2274 | 2233 | 2193 | 2153 | 2114 | 2075 |
| 39 | 2439 | 2397 | 2355 | 2314 | 2273 | 2233 | 2192 | 2153 | 2113 | 2074 |
| 40 | 2438 | 2396 | 2355 | 2313 | 2272 | 2232 | 2192 | 2152 | 2113 | 2073 |
| 41 | 2438 | 2396 | 2354 | 2313 | 2272 | 2231 | 2191 | 2151 | 2112 | 2073 |
| 42 | 2437 | 2395 | 2353 | 2312 | 2271 | 2231 | 2190 | 2151 | 2111 | 2072 |
| 43 | 2436 | 2394 | 2353 | 2311 | 2270 | 2230 | 2190 | 2150 | 2111 | 2071 |
| 44 | 2436 | 2394 | 2352 | 2311 | 2270 | 2229 | 2189 | 2149 | 2110 | 2071 |
| 45 | 2435 | 2393 | 2351 | 2310 | 2269 | 2229 | 2188 | 2149 | 2109 | 2070 |
| 46 | 2434 | 2392 | 2350 | 2309 | 2268 | 2228 | 2188 | 2148 | 2109 | 2070 |
| 47 | 2433 | 2391 | 2350 | 2308 | 2268 | 2227 | 2187 | 2147 | 2108 | 2069 |
| 48 | 2433 | 2391 | 2349 | 2308 | 2267 | 2227 | 2186 | 2147 | 2107 | 2068 |
| 49 | 2432 | 2390 | 2348 | 2307 | 2266 | 2226 | 2186 | 2146 | 2107 | 2068 |
| 50 | 2431 | 2389 | 2348 | 2306 | 2266 | 2225 | 2185 | 2145 | 2106 | 2067 |
| 51 | 2431 | 2389 | 2347 | 2306 | 2265 | 2225 | 2184 | 2145 | 2105 | 2066 |
| 52 | 2430 | 2388 | 2346 | 2305 | 2264 | 2224 | 2184 | 2144 | 2105 | 2066 |
| 53 | 2429 | 2387 | 2346 | 2304 | 2264 | 2223 | 2183 | 2143 | 2104 | 2065 |
| 54 | 2429 | 2387 | 2345 | 2304 | 2263 | 2223 | 2182 | 2143 | 2103 | 2064 |
| 55 | 2428 | 2386 | 2344 | 2303 | 2262 | 2222 | 2182 | 2142 | 2103 | 2064 |
| 56 | 2427 | 2385 | 2344 | 2302 | 2262 | 2221 | 2181 | 2141 | 2102 | 2063 |
| 57 | 2426 | 2384 | 2343 | 2302 | 2261 | 2220 | 2180 | 2141 | 2101 | 2062 |
| 58 | 2426 | 2384 | 2342 | 2301 | 2260 | 2220 | 2180 | 2140 | 2101 | 2062 |
| 59 | 2425 | 2383 | 2341 | 2300 | 2260 | 2219 | 2179 | 2139 | 2100 | 2061 |
| 60 | 2424 | 2382 | 2341 | 2300 | 2259 | 2218 | 2178 | 2139 | 2099 | 2061 |



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| ″ | h ° ′ 1. 52 | h ° ′ 1. 53 | h ° ′ 1. 54 | h ° ′ 1. 55 | h ° ′ 1. 56 | h ° ′ 1. 57 | h ° ′ 1. 58 | h ° ′ 1. 59 | h ° ′ 2. 0 | h ° ′ 2. 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2061 | 2022 | 1984 | 1946 | 1908 | 1871 | 1834 | 1797 | 1761 | 1725 |
| 1 | 2060 | 2021 | 1983 | 1945 | 1907 | 1870 | 1833 | 1797 | 1760 | 1724 |
| 2 | 2059 | 2021 | 1982 | 1944 | 1907 | 1870 | 1833 | 1796 | 1760 | 1724 |
| 3 | 2059 | 2020 | 1982 | 1944 | 1906 | 1869 | 1832 | 1795 | 1759 | 1723 |
| 4 | 3058 | 2019 | 1981 | 1943 | 1906 | 1868 | 1831 | 1795 | 1758 | 1722 |
| 5 | 2057 | 2019 | 1980 | 1943 | 1905 | 1868 | 1831 | 1794 | 1758 | 1722 |
| 6 | 2057 | 2018 | 1980 | 1942 | 1904 | 1867 | 1830 | 1794 | 1757 | 1721 |
| 7 | 2056 | 2017 | 1979 | 1941 | 1904 | 1867 | 1830 | 1793 | 1757 | 1721 |
| 8 | 2055 | 2017 | 1979 | 1941 | 1903 | 1866 | 1829 | 1792 | 1756 | 1720 |
| 9 | 2055 | 2016 | 1978 | 1940 | 1903 | 1865 | 1828 | 1792 | 1755 | 1719 |
| 10 | 2054 | 2016 | 1977 | 1939 | 1902 | 1865 | 1828 | 1791 | 1755 | 1719 |
| 11 | 2053 | 2015 | 1977 | 1939 | 1901 | 1864 | 1827 | 1791 | 1754 | 1718 |
| 12 | 2053 | 2014 | 1976 | 1938 | 1901 | 1863 | 1827 | 1790 | 1754 | 1718 |
| 13 | 2052 | 2014 | 1975 | 1938 | 1900 | 1863 | 1826 | 1789 | 1753 | 1717 |
| 14 | 2051 | 2013 | 1975 | 1937 | 1899 | 1862 | 1825 | 1789 | 1752 | 1716 |
| 15 | 2051 | 2012 | 1974 | 1936 | 1899 | 1862 | 1825 | 1788 | 1752 | 1716 |
| 16 | 2050 | 2012 | 1973 | 1936 | 1898 | 1861 | 1824 | 1787 | 1751 | 1715 |
| 17 | 2050 | 2011 | 1973 | 1935 | 1898 | 1860 | 1823 | 1787 | 1751 | 1715 |
| 18 | 2049 | 2010 | 1972 | 1934 | 1897 | 1860 | 1823 | 1786 | 1750 | 1714 |
| 19 | 2048 | 2010 | 1972 | 1934 | 1896 | 1859 | 1822 | 1786 | 1749 | 1713 |
| 20 | 2048 | 2009 | 1971 | 1933 | 1896 | 1858 | 1822 | 1785 | 1749 | 1713 |
| 21 | 3047 | 2009 | 1970 | 1933 | 1895 | 1858 | 1821 | 1785 | 1748 | 1712 |
| 22 | 2046 | 2008 | 1970 | 1932 | 1894 | 1857 | 1820 | 1784 | 1748 | 1712 |
| 23 | 2046 | 2007 | 1969 | 1931 | 1894 | 1857 | 1820 | 1783 | 1747 | 1711 |
| 24 | 2045 | 2007 | 1968 | 1931 | 1893 | 1856 | 1819 | 1783 | 1746 | 1711 |
| 25 | 2044 | 2006 | 1968 | 1930 | 1893 | 1855 | 1819 | 1782 | 1746 | 1710 |
| 26 | 2044 | 2005 | 1967 | 1929 | 1892 | 1855 | 1818 | 1781 | 1745 | 1709 |
| 27 | 2043 | 2005 | 1967 | 1929 | 1891 | 1854 | 1817 | 1781 | 1745 | 1709 |
| 28 | 2042 | 2004 | 1966 | 1928 | 1891 | 1854 | 1817 | 1780 | 1744 | 1708 |
| 29 | 2042 | 2004 | 1965 | 1927 | 1890 | 1853 | 1816 | 1780 | 1743 | 1708 |
| 30 | 2041 | 2003 | 1965 | 1927 | 1889 | 1852 | 1816 | 1779 | 1743 | 1707 |

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| " | h ° ' 1. 52 | h ° ' 1. 53 | h ° ' 1. 54 | h ° ' 1. 55 | h ° ' 1. 56 | h ° ' 1. 57 | h ° ' 1. 58 | h ° ' 1. 59 | h ° ' 2. 0 | h ° ' 2. 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 2041 | 2002 | 1964 | 1926 | 1889 | 1852 | 1815 | 1778 | 1742 | 1706 |
| 32 | 2040 | 2001 | 1963 | 1926 | 1888 | 1851 | 1814 | 1778 | 1742 | 1706 |
| 33 | 2039 | 2001 | 1963 | 1925 | 1888 | 1850 | 1814 | 1777 | 1741 | 1705 |
| 34 | 2039 | 2000 | 1962 | 1924 | 1887 | 1850 | 1813 | 1777 | 1740 | 1705 |
| 35 | 2038 | 2000 | 1961 | 1924 | 1886 | 1849 | 1812 | 1776 | 1740 | 1704 |
| 36 | 2037 | 1999 | 1961 | 1923 | 1886 | 1849 | 1812 | 1775 | 1739 | 1703 |
| 37 | 2037 | 1998 | 1960 | 1922 | 1885 | 1848 | 1811 | 1775 | 1739 | 1703 |
| 38 | 2036 | 1998 | 1960 | 1922 | 1884 | 1847 | 1811 | 1774 | 1738 | 1702 |
| 39 | 2035 | 1997 | 1959 | 1921 | 1884 | 1847 | 1810 | 1774 | 1737 | 1702 |
| 40 | 2035 | 1996 | 1958 | 1921 | 1883 | 1846 | 1809 | 1773 | 1737 | 1701 |
| 41 | 2034 | 1996 | 1958 | 1920 | 1883 | 1846 | 1809 | 1772 | 1736 | 1700 |
| 42 | 2033 | 1995 | 1957 | 1919 | 1882 | 1845 | 1808 | 1772 | 1736 | 1700 |
| 43 | 2033 | 1994 | 1956 | 1919 | 1881 | 1844 | 1808 | 1771 | 1735 | 1699 |
| 44 | 2032 | 1994 | 1956 | 1918 | 1881 | 1844 | 1807 | 1771 | 1734 | 1699 |
| 45 | 2032 | 1993 | 1955 | 1918 | 1880 | 1843 | 1806 | 1770 | 1734 | 1698 |
| 46 | 2031 | 1993 | 1955 | 1917 | 1879 | 1842 | 1806 | 1769 | 1733 | 1697 |
| 47 | 2030 | 1992 | 1954 | 1916 | 1879 | 1842 | 1805 | 1769 | 1733 | 1697 |
| 48 | 2030 | 1991 | 1953 | 1916 | 1878 | 1841 | 1805 | 1768 | 1732 | 1696 |
| 49 | 2029 | 1991 | 1953 | 1915 | 1878 | 1841 | 1804 | 1768 | 1731 | 1696 |
| 50 | 2028 | 1990 | 1952 | 1914 | 1877 | 1840 | 1803 | 1767 | 1731 | 1695 |
| 51 | 2028 | 1989 | 1951 | 1914 | 1876 | 1839 | 1803 | 1766 | 1730 | 1694 |
| 52 | 2027 | 1989 | 1951 | 1913 | 1876 | 1839 | 1802 | 1766 | 1730 | 1694 |
| 53 | 2026 | 1988 | 1950 | 1912 | 1875 | 1838 | 1801 | 1765 | 1729 | 1693 |
| 54 | 2026 | 1987 | 1950 | 1912 | 1875 | 1838 | 1801 | 1765 | 1728 | 1693 |
| 55 | 2025 | 1987 | 1949 | 1911 | 1874 | 1837 | 1800 | 1764 | 1728 | 1692 |
| 56 | 2024 | 1986 | 1948 | 1911 | 1875 | 1836 | 1800 | 1763 | 1727 | 1691 |
| 57 | 2024 | 1986 | 1948 | 1910 | 1873 | 1836 | 1799 | 1763 | 1727 | 1691 |
| 58 | 2023 | 1985 | 1947 | 1909 | 1872 | 1835 | 1798 | 1762 | 1726 | 1690 |
| 59 | 2023 | 1984 | 1946 | 1909 | 1871 | 1834 | 1798 | 1761 | 1725 | 1690 |
| 60 | 2022 | 1984 | 1946 | 1908 | 1871 | 1834 | 1797 | 1761 | 1725 | 1689 |



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| ″ | h ° ′ 2. 2 | h ° ′ 2. 3 | h ° ′ 2. 4 | h ° ′ 2. 5 | h ° ′ 2. 6 | h ° ′ 2. 7 | h ° ′ 2. 8 | h ° ′ 2. 9 | h ° ′ 2. 10 | h ° ′ 2. 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1689 | 1654 | 1619 | 1584 | 1549 | 1515 | 1481 | 1447 | 1413 | 1380 |
| 1 | 1688 | 1653 | 1618 | 1583 | 1548 | 1514 | 1480 | 1446 | 1413 | 1379 |
| 2 | 1688 | 1652 | 1617 | 1582 | 1548 | 1514 | 1479 | 1446 | 1412 | 1379 |
| 3 | 1687 | 1652 | 1617 | 1582 | 1547 | 1513 | 1479 | 1445 | 1412 | 1378 |
| 4 | 1687 | 1651 | 1616 | 1581 | 1547 | 1512 | 1478 | 1445 | 1411 | 1378 |
| 5 | 1686 | 1651 | 1616 | 1581 | 1546 | 1512 | 1478 | 1444 | 1410 | 1377 |
| 6 | 1686 | 1650 | 1615 | 1580 | 1546 | 1511 | 1477 | 1443 | 1410 | 1377 |
| 7 | 1685 | 1650 | 1614 | 1580 | 1545 | 1511 | 1477 | 1443 | 1409 | 1376 |
| 8 | 1684 | 1649 | 1614 | 1579 | 1544 | 1510 | 1476 | 1442 | 1409 | 1376 |
| 9 | 1684 | 1648 | 1613 | 1578 | 1544 | 1510 | 1476 | 1442 | 1408 | 1375 |
| 10 | 1683 | 1648 | 1613 | 1578 | 1543 | 1509 | 1475 | 1441 | 1408 | 1374 |
| 11 | 1683 | 1647 | 1612 | 1577 | 1543 | 1508 | 1474 | 1441 | 1407 | 1374 |
| 12 | 1682 | 1647 | 1612 | 1577 | 1542 | 1508 | 1474 | 1440 | 1407 | 1373 |
| 13 | 1681 | 1646 | 1611 | 1576 | 1542 | 1507 | 1473 | 1440 | 1406 | 1373 |
| 14 | 1681 | 1645 | 1610 | 1575 | 1541 | 1507 | 1473 | 1439 | 1405 | 1372 |
| 15 | 1680 | 1645 | 1610 | 1575 | 1540 | 1506 | 1472 | 1438 | 1405 | 1372 |
| 16 | 1680 | 1644 | 1609 | 1574 | 1540 | 1506 | 1472 | 1438 | 1404 | 1371 |
| 17 | 1679 | 1644 | 1609 | 1574 | 1539 | 1505 | 1471 | 1437 | 1404 | 1371 |
| 18 | 1678 | 1643 | 1608 | 1573 | 1539 | 1504 | 1470 | 1437 | 1403 | 1370 |
| 19 | 1678 | 1642 | 1607 | 1573 | 1538 | 1504 | 1470 | 1436 | 1403 | 1369 |
| 20 | 1677 | 1642 | 1607 | 1572 | 1538 | 1503 | 1469 | 1436 | 1402 | 1369 |
| 21 | 1677 | 1641 | 1606 | 1571 | 1537 | 1503 | 1469 | 1435 | 1402 | 1368 |
| 22 | 1676 | 1641 | 1606 | 1571 | 1536 | 1502 | 1468 | 1434 | 1401 | 1368 |
| 23 | 1675 | 1640 | 1605 | 1570 | 1536 | 1502 | 1468 | 1434 | 1400 | 1367 |
| 24 | 1675 | 1640 | 1605 | 1570 | 1535 | 1501 | 1467 | 1433 | 1400 | 1367 |
| 25 | 1674 | 1639 | 1604 | 1569 | 1535 | 1500 | 1466 | 1433 | 1399 | 1366 |
| 26 | 1674 | 1638 | 1603 | 1569 | 1534 | 1500 | 1466 | 1432 | 1399 | 1366 |
| 27 | 1673 | 1638 | 1603 | 1568 | 1534 | 1499 | 1465 | 1432 | 1398 | 1365 |
| 28 | 1673 | 1637 | 1602 | 1567 | 1533 | 1499 | 1465 | 1431 | 1398 | 1365 |
| 29 | 1672 | 1637 | 1602 | 1567 | 1532 | 1498 | 1464 | 1431 | 1397 | 1364 |
| 30 | 1671 | 1636 | 1601 | 1566 | 1532 | 1498 | 1464 | 1430 | 1397 | 1363 |

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| ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ | h ′ ° ′ |
|---|---|---|---|---|---|---|---|---|---|---|
| ″ | 2. 2 | 2. 3 | 2. 4 | 2. 5 | 2. 6 | 2. 7 | 2. 8 | 2. 9 | 2. 10 | 2. 11 |
| 31 | 1671 | 1635 | 1600 | 1566 | 1531 | 1497 | 1463 | 1429 | 1396 | 1363 |
| 32 | 1670 | 1635 | 1600 | 1565 | 1531 | 1496 | 1463 | 1429 | 1395 | 1362 |
| 33 | 1670 | 1634 | 1599 | 1565 | 1530 | 1496 | 1462 | 1428 | 1395 | 1362 |
| 34 | 1669 | 1634 | 1599 | 1564 | 1529 | 1495 | 1461 | 1428 | 1394 | 1361 |
| 35 | 1668 | 1633 | 1598 | 1563 | 1529 | 1495 | 1461 | 1427 | 1394 | 1361 |
| 36 | 1668 | 1633 | 1598 | 1563 | 1528 | 1494 | 1460 | 1427 | 1393 | 1360 |
| 37 | 1667 | 1632 | 1597 | 1562 | 1528 | 1494 | 1460 | 1426 | 1393 | 1360 |
| 38 | 1667 | 1631 | 1596 | 1562 | 1527 | 1493 | 1459 | 1426 | 1392 | 1359 |
| 39 | 1666 | 1631 | 1596 | 1561 | 1527 | 1493 | 1459 | 1425 | 1392 | 1359 |
| 40 | 1665 | 1630 | 1595 | 1560 | 1526 | 1492 | 1458 | 1424 | 1391 | 1358 |
| 41 | 1665 | 1630 | 1595 | 1560 | 1525 | 1491 | 1457 | 1424 | 1390 | 1357 |
| 42 | 1664 | 1629 | 1594 | 1559 | 1525 | 1491 | 1457 | 1423 | 1390 | 1357 |
| 43 | 1664 | 1628 | 1593 | 1559 | 1524 | 1490 | 1456 | 1423 | 1389 | 1356 |
| 44 | 1663 | 1628 | 1593 | 1558 | 1524 | 1490 | 1456 | 1422 | 1389 | 1356 |
| 45 | 1663 | 1627 | 1592 | 1558 | 1523 | 1489 | 1455 | 1422 | 1388 | 1355 |
| 46 | 1662 | 1627 | 1592 | 1557 | 1523 | 1489 | 1455 | 1421 | 1388 | 1355 |
| 47 | 1661 | 1626 | 1591 | 1556 | 1522 | 1488 | 1454 | 1420 | 1387 | 1354 |
| 48 | 1661 | 1626 | 1591 | 1556 | 1522 | 1487 | 1454 | 1420 | 1387 | 1354 |
| 49 | 1660 | 1625 | 1590 | 1555 | 1521 | 1487 | 1453 | 1419 | 1386 | 1353 |
| 50 | 1660 | 1624 | 1589 | 1555 | 1520 | 1486 | 1452 | 1419 | 1386 | 1352 |
| 51 | 1659 | 1624 | 1589 | 1554 | 1520 | 1486 | 1452 | 1418 | 1385 | 1352 |
| 52 | 1658 | 1623 | 1588 | 1554 | 1519 | 1485 | 1451 | 1418 | 1384 | 1351 |
| 53 | 1658 | 1623 | 1588 | 1553 | 1518 | 1485 | 1451 | 1417 | 1384 | 1351 |
| 54 | 1657 | 1622 | 1587 | 1552 | 1518 | 1484 | 1450 | 1417 | 1383 | 1350 |
| 55 | 1657 | 1621 | 1586 | 1552 | 1518 | 1483 | 1450 | 1416 | 1383 | 1350 |
| 56 | 1656 | 1621 | 1586 | 1551 | 1517 | 1483 | 1449 | 1415 | 1382 | 1349 |
| 57 | 1655 | 1620 | 1585 | 1551 | 1516 | 1482 | 1449 | 1415 | 1382 | 1349 |
| 58 | 1655 | 1620 | 1585 | 1550 | 1516 | 1482 | 1448 | 1414 | 1381 | 1348 |
| 59 | 1654 | 1619 | 1584 | 1550 | 1515 | 1481 | 1447 | 1414 | 1381 | 1347 |
| 60 | 1654 | 1619 | 1584 | 1549 | 1515 | 1481 | 1447 | 1413 | 1380 | 1347 |

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| " | h ° ′ 2. 12 | h ° ′ 2. 13 | h ° ′ 2. 14 | h ° ′ 2. 15 | h ° ′ 2. 16 | h ° ′ 2 17 | h ° ′ 2. 18 | h ° ′ 2. 19 | h ° ′ 2. 20 | h ° ′ 2. 21 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1347 | 1314 | 1282 | 1249 | 1217 | 1186 | 1154 | 1123 | 1091 | 1061 |
| 1 | 1346 | 1314 | 1281 | 1249 | 1217 | 1185 | 1153 | 1122 | 1091 | 1060 |
| 2 | 1346 | 1313 | 1281 | 1248 | 1216 | 1184 | 1153 | 1121 | 1090 | 1059 |
| 3 | 1345 | 1313 | 1280 | 1248 | 1216 | 1184 | 1152 | 1121 | 1090 | 1059 |
| 4 | 1345 | 1312 | 1279 | 1247 | 1215 | 1183 | 1152 | 1120 | 1089 | 1058 |
| 5 | 1344 | 1311 | 1279 | 1247 | 1215 | 1183 | 1151 | 1120 | 1089 | 1058 |
| 6 | 1344 | 1311 | 1278 | 1246 | 1214 | 1182 | 1151 | 1119 | 1088 | 1057 |
| 7 | 1343 | 1310 | 1278 | 1246 | 1214 | 1182 | 1150 | 1119 | 1088 | 1057 |
| 8 | 1343 | 1310 | 1277 | 1245 | 1213 | 1181 | 1150 | 1118 | 1087 | 1056 |
| 9 | 1342 | 1309 | 1277 | 1245 | 1213 | 1181 | 1149 | 1118 | 1087 | 1056 |
| 10 | 1341 | 1309 | 1276 | 1244 | 1212 | 1180 | 1149 | 1117 | 1086 | 1055 |
| 11 | 1341 | 1308 | 1276 | 1243 | 1211 | 1180 | 1148 | 1117 | 1086 | 1055 |
| 12 | 1340 | 1308 | 1275 | 1243 | 1211 | 1179 | 1148 | 1116 | 1085 | 1054 |
| 13 | 1340 | 1307 | 1275 | 1242 | 1210 | 1179 | 1147 | 1116 | 1085 | 1054 |
| 14 | 1339 | 1307 | 1274 | 1242 | 1210 | 1178 | 1147 | 1115 | 1084 | 1053 |
| 15 | 1339 | 1306 | 1274 | 1241 | 1209 | 1178 | 1146 | 1115 | 1084 | 1053 |
| 16 | 1338 | 1305 | 1273 | 1241 | 1209 | 1177 | 1146 | 1114 | 1083 | 1052 |
| 17 | 1338 | 1305 | 1272 | 1240 | 1208 | 1177 | 1145 | 1114 | 1083 | 1052 |
| 18 | 1337 | 1304 | 1272 | 1240 | 1208 | 1176 | 1145 | 1113 | 1082 | 1051 |
| 19 | 1337 | 1304 | 1271 | 1239 | 1207 | 1175 | 1144 | 1113 | 1082 | 1051 |
| 20 | 1336 | 1303 | 1271 | 1239 | 1207 | 1175 | 1143 | 1112 | 1081 | 1050 |
| 21 | 1335 | 1303 | 1270 | 1238 | 1206 | 1174 | 1143 | 1112 | 1081 | 1050 |
| 22 | 1335 | 1302 | 1270 | 1238 | 1206 | 1174 | 1142 | 1111 | 1080 | 1049 |
| 23 | 1334 | 1302 | 1269 | 1237 | 1205 | 1173 | 1142 | 1111 | 1080 | 1049 |
| 24 | 1334 | 1301 | 1269 | 1237 | 1205 | 1173 | 1141 | 1110 | 1079 | 1048 |
| 25 | 1333 | 1301 | 1268 | 1236 | 1204 | 1172 | 1141 | 1110 | 1079 | 1048 |
| 26 | 1333 | 1300 | 1268 | 1235 | 1203 | 1172 | 1140 | 1109 | 1078 | 1047 |
| 27 | 1332 | 1300 | 1267 | 1235 | 1203 | 1171 | 1140 | 1109 | 1078 | 1047 |
| 28 | 1332 | 1299 | 1267 | 1234 | 1202 | 1171 | 1139 | 1108 | 1077 | 1046 |
| 29 | 1331 | 1298 | 1266 | 1234 | 1202 | 1170 | 1139 | 1107 | 1076 | 1046 |
| 30 | 1331 | 1298 | 1266 | 1233 | 1201 | 1170 | 1138 | 1107 | 1076 | 1045 |

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| " | h ° ′ 2. 12 | h ° ′ 2. 13 | h ° ′ 2. 14 | h ° ′ 2. 15 | h ° ′ 2. 16 | h ° ′ 2. 17 | h ° ′ 2. 18 | h ° ′ 2. 19 | h ° ′ 2. 20 | h ° ′ 2. 21 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 1330 | 1297 | 1265 | 1233 | 1201 | 1169 | 1138 | 1106 | 1075 | 1045 |
| 32 | 1329 | 1297 | 1264 | 1232 | 1200 | 1169 | 1137 | 1106 | 1075 | 1044 |
| 33 | 1329 | 1296 | 1264 | 1232 | 1200 | 1168 | 1137 | 1105 | 1074 | 1044 |
| 34 | 1328 | 1296 | 1263 | 1231 | 1199 | 1168 | 1136 | 1105 | 1074 | 1043 |
| 35 | 1328 | 1295 | 1263 | 1231 | 1199 | 1167 | 1136 | 1104 | 1073 | 1043 |
| 36 | 1327 | 1295 | 1262 | 1230 | 1198 | 1167 | 1135 | 1104 | 1073 | 1042 |
| 37 | 1327 | 1294 | 1262 | 1230 | 1198 | 1166 | 1135 | 1103 | 1072 | 1042 |
| 38 | 1326 | 1294 | 1261 | 1229 | 1197 | 1165 | 1134 | 1103 | 1072 | 1041 |
| 39 | 1326 | 1293 | 1261 | 1229 | 1197 | 1165 | 1134 | 1102 | 1071 | 1041 |
| 40 | 1325 | 1292 | 1260 | 1228 | 1196 | 1164 | 1133 | 1102 | 1071 | 1040 |
| 41 | 1325 | 1292 | 1260 | 1227 | 1196 | 1164 | 1132 | 1101 | 1070 | 1039 |
| 42 | 1324 | 1291 | 1259 | 1227 | 1195 | 1163 | 1132 | 1101 | 1070 | 1039 |
| 43 | 1323 | 1291 | 1258 | 1226 | 1194 | 1163 | 1131 | 1100 | 1069 | 1038 |
| 44 | 1323 | 1290 | 1258 | 1226 | 1194 | 1162 | 1131 | 1100 | 1069 | 1038 |
| 45 | 1322 | 1290 | 1257 | 1225 | 1193 | 1162 | 1130 | 1099 | 1068 | 1037 |
| 46 | 1322 | 1289 | 1257 | 1225 | 1193 | 1161 | 1130 | 1099 | 1068 | 1037 |
| 47 | 1321 | 1289 | 1256 | 1224 | 1192 | 1161 | 1129 | 1098 | 1067 | 1036 |
| 48 | 1321 | 1288 | 1256 | 1224 | 1192 | 1160 | 1129 | 1098 | 1067 | 1036 |
| 49 | 1320 | 1288 | 1255 | 1223 | 1191 | 1160 | 1128 | 1097 | 1066 | 1035 |
| 50 | 1320 | 1287 | 1255 | 1223 | 1191 | 1159 | 1128 | 1097 | 1066 | 1035 |
| 51 | 1319 | 1287 | 1254 | 1222 | 1190 | 1159 | 1127 | 1096 | 1065 | 1034 |
| 52 | 1319 | 1286 | 1254 | 1222 | 1190 | 1158 | 1127 | 1096 | 1065 | 1034 |
| 53 | 1318 | 1285 | 1253 | 1221 | 1189 | 1158 | 1126 | 1095 | 1064 | 1033 |
| 54 | 1317 | 1285 | 1253 | 1221 | 1189 | 1157 | 1126 | 1095 | 1064 | 1033 |
| 55 | 1317 | 1284 | 1252 | 1220 | 1188 | 1157 | 1125 | 1094 | 1063 | 1032 |
| 56 | 1316 | 1284 | 1251 | 1219 | 1188 | 1156 | 1125 | 1093 | 1063 | 1032 |
| 57 | 1316 | 1283 | 1251 | 1219 | 1187 | 1156 | 1124 | 1093 | 1062 | 1031 |
| 58 | 1315 | 1283 | 1250 | 1218 | 1187 | 1155 | 1124 | 1092 | 1062 | 1031 |
| 59 | 1315 | 1282 | 1250 | 1218 | 1186 | 1154 | 1123 | 1092 | 1061 | 1030 |
| 60 | 1314 | 1282 | 1249 | 1217 | 1186 | 1154 | 1123 | 1091 | 1061 | 1030 |

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| ″ | h ° ′ 2. 22 | h ° ′ 2. 23 | h ° ′ 2. 24 | h ° ′ 2. 25 | h ° ′ 2. 26 | h ° ′ 2. 27 | h ° ′ 2. 28 | h ° ′ 2. 29 | h ° ′ 2. 30 | h ° ′ 2. 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1030 | 0999 | 0969 | 0939 | 0909 | 0880 | 0850 | 0821 | 0792 | 0763 |
| 1 | 1029 | 0999 | 0969 | 0939 | 0909 | 0879 | 0850 | 0820 | 0791 | 0762 |
| 2 | 1029 | 0998 | 0968 | 0938 | 0908 | 0879 | 0849 | 0820 | 0791 | 0762 |
| 3 | 1028 | 0998 | 0968 | 0938 | 0908 | 0878 | 0849 | 0819 | 0790 | 0762 |
| 4 | 1028 | 0997 | 0967 | 0937 | 0907 | 0878 | 0848 | 0819 | 0790 | 0761 |
| 5 | 1027 | 0997 | 0967 | 0937 | 0907 | 0877 | 0848 | 0818 | 0789 | 0761 |
| 6 | 1027 | 0696 | 0966 | 0936 | 0906 | 0877 | 0847 | 0818 | 0789 | 0760 |
| 7 | 1026 | 0996 | 0966 | 0936 | 0906 | 0876 | 0847 | 0817 | 0788 | 0760 |
| 8 | 1026 | 0995 | 0995 | 0935 | 0905 | 0876 | 0846 | 0817 | 0788 | 0759 |
| 9 | 1025 | 0995 | 0965 | 0935 | 0905 | 0875 | 0846 | 8816 | 0787 | 0759 |
| 10 | 1025 | 0994 | 0964 | 0934 | 0904 | 0875 | 0845 | 0816 | 0787 | 0758 |
| 11 | 1024 | 0994 | 0964 | 0934 | 0904 | 0874 | 0845 | 0815 | 0787 | 0758 |
| 12 | 1024 | 0993 | 0963 | 0933 | 0903 | 0874 | 0844 | 0815 | 0786 | 0757 |
| 13 | 1023 | 0993 | 0963 | 0933 | 0903 | 0873 | 0844 | 0814 | 0786 | 0757 |
| 14 | 1023 | 0992 | 0962 | 0932 | 0902 | 0873 | 0843 | 0814 | 0785 | 0756 |
| 15 | 1022 | 0992 | 0962 | 0932 | 0902 | 0872 | 0843 | 0814 | 0785 | 0756 |
| 16 | 1022 | 0991 | 0961 | 0931 | 0901 | 0872 | 0842 | 0813 | 0784 | 0755 |
| 17 | 1021 | 0991 | 0961 | 0931 | 0901 | 0871 | 0842 | 0813 | 0784 | 0755 |
| 18 | 1021 | 0990 | 0960 | 0930 | 0900 | 0871 | 0841 | 0812 | 0783 | 0754 |
| 19 | 1020 | 0990 | 0960 | 0930 | 0900 | 0870 | 0841 | 0812 | 0783 | 0754 |
| 20 | 1020 | 0989 | 0959 | 2029 | 0899 | 0870 | 0840 | 0811 | 0782 | 0753 |
| 21 | 1019 | 0989 | 0959 | 0929 | 0899 | 0869 | 0840 | 0811 | 0782 | 0753 |
| 22 | 1019 | 0988 | 0958 | 0928 | 0898 | 0869 | 0839 | 0810 | 0781 | 0752 |
| 23 | 1018 | 0988 | 0958 | 0928 | 0898 | 0868 | 0839 | 0810 | 0781 | 0752 |
| 24 | 1018 | 0987 | 0957 | 0927 | 0897 | 0868 | 0838 | 0809 | 0780 | 0751 |
| 25 | 1017 | 0987 | 0957 | 0927 | 0897 | 0867 | 0838 | 0809 | 0780 | 0751 |
| 26 | 1017 | 0986 | 0956 | 0926 | 0896 | 0867 | 0837 | 0808 | 0779 | 0750 |
| 27 | 1016 | 0986 | 0956 | 0926 | 0896 | 0866 | 0837 | 0808 | 0779 | 0750 |
| 28 | 1016 | 0985 | 0955 | 0925 | 0895 | 0866 | 0836 | 0807 | 0778 | 0750 |
| 29 | 1015 | 0985 | 0955 | 0925 | 0895 | 0865 | 0836 | 0807 | 0778 | 0749 |
| 30 | 1015 | 0984 | 0954 | 0924 | 0894 | 0865 | 0835 | 0806 | 0777 | 0749 |

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| ″ | h. ′ ° ′ 2. 22 | h. ′ ° ′ 2. 23 | h. ′ ° ′ 2. 24 | h. ′ ° ′ 2. 25 | h. ′ ° ′ 2. 26 | h. ′ ° ′ 2. 27 | h. ′ ° ′ 2. 28 | h. ′ ° ′ 2. 29 | h. ′ ° ′ 2. 30 | h. ′ ° ′ 2. 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 1014 | 0984 | 0954 | 0924 | 0894 | 0864 | 0835 | 0806 | 0777 | 0748 |
| 32 | 1014 | 0983 | 0953 | 0923 | 0893 | 0864 | 0834 | 0805 | 0776 | 0748 |
| 33 | 1013 | 0983 | 0953 | 0923 | 0893 | 0863 | 0834 | 0805 | 0776 | 0747 |
| 34 | 1013 | 0982 | 0952 | 0922 | 0892 | 0863 | 0833 | 0804 | 0775 | 0747 |
| 35 | 1012 | 0982 | 0952 | 0922 | 0892 | 0862 | 0833 | 0804 | 0775 | 0746 |
| 36 | 1012 | 0981 | 0951 | 0921 | 0891 | 0862 | 0833 | 0803 | 0774 | 0746 |
| 37 | 1011 | 0981 | 0951 | 0921 | 0891 | 0861 | 0832 | 0803 | 0774 | 0745 |
| 38 | 1010 | 0980 | 0950 | 0920 | 0890 | 0861 | 0832 | 0802 | 0773 | 0745 |
| 39 | 1010 | 0980 | 0950 | 0920 | 0890 | 0860 | 0831 | 0802 | 0773 | 0744 |
| 40 | 1009 | 0979 | 0949 | 0919 | 0889 | 0860 | 0831 | 0801 | 0773 | 0744 |
| 41 | 1009 | 0979 | 0949 | 0919 | 0889 | 0859 | 0830 | 0801 | 0772 | 0743 |
| 42 | 1008 | 0978 | 0948 | 0918 | 0888 | 0859 | 0830 | 0801 | 0772 | 0743 |
| 43 | 1008 | 0978 | 0948 | 0918 | 0888 | 0858 | 0829 | 0800 | 0771 | 0742 |
| 44 | 1007 | 0977 | 0947 | 0917 | 0887 | 0858 | 0829 | 0800 | 0771 | 0742 |
| 45 | 1007 | 0977 | 0947 | 0917 | 0887 | 0857 | 0828 | 0799 | 0770 | 0741 |
| 46 | 1006 | 0976 | 0946 | 0916 | 0886 | 9857 | 0828 | 0799 | 0770 | 0741 |
| 47 | 1006 | 0976 | 0946 | 0916 | 0886 | 0856 | 0827 | 0798 | 0769 | 0740 |
| 48 | 1005 | 0975 | 0945 | 0915 | 0885 | 0856 | 0827 | 0798 | 0769 | 0740 |
| 49 | 1005 | 0975 | 0945 | 0915 | 0885 | 0855 | 0826 | 0797 | 0768 | 0739 |
| 50 | 1004 | 0974 | 0944 | 0914 | 0884 | 0855 | 0826 | 0797 | 0768 | 0739 |
| 51 | 1004 | 0974 | 0944 | 0914 | 0884 | 0855 | 0825 | 0796 | 0767 | 0739 |
| 52 | 1003 | 0973 | 0943 | 0913 | 0883 | 0854 | 0825 | 0796 | 0767 | 0738 |
| 53 | 1003 | 0973 | 0943 | 0913 | 0883 | 0854 | 0824 | 0795 | 0766 | 0738 |
| 54 | 1002 | 0972 | 0942 | 0912 | 0883 | 0853 | 0824 | 0795 | 0766 | 0737 |
| 55 | 1002 | 0972 | 0942 | 0912 | 0882 | 0853 | 0823 | 0794 | 0765 | 0737 |
| 56 | 1001 | 0971 | 4941 | 0911 | 0882 | 0852 | 0823 | 0794 | 0765 | 0736 |
| 57 | 1001 | 0971 | 0941 | 0911 | 0881 | 0852 | 0822 | 0793 | 0764 | 0736 |
| 58 | 1000 | 0970 | 0940 | 0910 | 0881 | 0851 | 0822 | 0793 | 0764 | 0735 |
| 59 | 1000 | 0970 | 0940 | 0910 | 0880 | 0851 | 0821 | 0792 | 0763 | 0735 |
| 60 | 0999 | 0969 | 0939 | 0909 | 0880 | 0850 | 0821 | 0792 | 0763 | 0734 |



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| " | h. ′ ° ′ 2. 32 | h. ′ ° ′ 2. 33 | h. ′ ° ′ 2. 34 | h. ′ ° ′ 2. 35 | h. ′ ° ′ 2. 36 | h. ′ ° ′ 2. 37 | h. ′ ° ′ 2. 38 | h. ′ ° ′ 2. 39 | h. ′ ° ′ 2. 40 | h. ′ ° ′ 2. 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0734 | 0706 | 0678 | 0649 | 0621 | 0594 | 0566 | 0539 | 0512 | 0484 |
| 1 | 0734 | 0705 | 0677 | 0649 | 0621 | 0593 | 0566 | 0538 | 0511 | 0484 |
| 2 | 0733 | 0705 | 0677 | 0648 | 0621 | 0592 | 0565 | 0538 | 0511 | 0484 |
| 3 | 0733 | 0704 | 0676 | 0648 | 0620 | 0592 | 0565 | 0537 | 0510 | 0483 |
| 4 | 0732 | 0704 | 0676 | 0648 | 0620 | 0592 | 0564 | 0537 | 0510 | 0483 |
| 5 | 0732 | 0703 | 0675 | 0647 | 0619 | 0591 | 0564 | 0536 | 0509 | 0482 |
| 6 | 0731 | 0703 | 0675 | 0647 | 0619 | 0591 | 0563 | 0536 | 0509 | 0482 |
| 7 | 0731 | 0702 | 0674 | 0646 | 0618 | 0590 | 0563 | 0536 | 0508 | 0481 |
| 8 | 0730 | 0702 | 0674 | 0646 | 0618 | 0590 | 0562 | 0535 | 0508 | 0481 |
| 9 | 0730 | 0702 | 0673 | 0645 | 0617 | 0590 | 0562 | 0535 | 0507 | 0480 |
| 10 | 0729 | 0701 | 0673 | 0645 | 0617 | 0589 | 0562 | 0534 | 0507 | 0480 |
| 11 | 0729 | 0701 | 0672 | 0644 | 0616 | 0589 | 0561 | 0534 | 0507 | 0479 |
| 12 | 0729 | 0700 | 0672 | 0644 | 0616 | 0588 | 0561 | 0533 | 0506 | 0479 |
| 13 | 0728 | 0700 | 0671 | 0643 | 0615 | 0588 | 0560 | 0533 | 0506 | 0479 |
| 14 | 0728 | 0699 | 0671 | 0643 | 0615 | 0587 | 0560 | 0532 | 0505 | 0478 |
| 15 | 0727 | 0699 | 0670 | 0642 | 0615 | 0587 | 0559 | 0532 | 0505 | 0478 |
| 16 | 0727 | 0698 | 0670 | 0642 | 0614 | 0586 | 0559 | 0531 | 0504 | 0477 |
| 17 | 0726 | 0698 | 0669 | 0641 | 0614 | 0986 | 0558 | 0531 | 0504 | 0477 |
| 18 | 0726 | 0697 | 0669 | 0641 | 0613 | 0585 | 0558 | 0531 | 0503 | 0476 |
| 19 | 0725 | 0697 | 0669 | 9641 | 0613 | 0585 | 0557 | 0530 | 0503 | 0476 |
| 20 | 0725 | 0696 | 0668 | 0640 | 0612 | 0584 | 0557 | 0530 | 0502 | 0475 |
| 21 | 0724 | 0696 | 0668 | 0640 | 0612 | 0584 | 0557 | 0529 | 0502 | 0475 |
| 22 | 0724 | 0695 | 0667 | 0639 | 0611 | 0584 | 0556 | 0529 | 0501 | 0475 |
| 23 | 0723 | 0695 | 0667 | 0639 | 0611 | 0583 | 0556 | 0528 | 0501 | 0474 |
| 24 | 0723 | 0694 | 0666 | 0638 | 0610 | 0583 | 0555 | 0528 | 0501 | 0474 |
| 25 | 0722 | 0694 | 0666 | 0638 | 0610 | 0582 | 0555 | 0527 | 0500 | 0473 |
| 26 | 0722 | 0693 | 0665 | 0637 | 0609 | 0582 | 0554 | 0527 | 0500 | 0473 |
| 27 | 0721 | 0693 | 0665 | 0637 | 0609 | 0581 | 0554 | 0526 | 0499 | 0472 |
| 28 | 0721 | 0693 | 0664 | 0636 | 0608 | 0581 | 0553 | 0526 | 0499 | 0472 |
| 29 | 0720 | 0692 | 0664 | 0636 | 0608 | 0580 | 0553 | 0526 | 0498 | 0471 |
| 30 | 0720 | 0692 | 0663 | 0635 | 0608 | 0580 | 0552 | 0525 | 0498 | 0471 |

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| ″ | h. ° ′ 2. 32 | h. ° ′ 2. 33 | h. ° ′ 2. 34 | h. ° ′ 2. 35 | h. ° ′ 2. 36 | h. ° ′ 2. 37 | h. ° ′ 2. 38 | h. ° ′ 2. 39 | h. ° ′ 2. 40 | h. ° ′ 2. 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 0720 | 0691 | 0663 | 0635 | 0607 | 0579 | 0552 | 0525 | 0497 | 0471 |
| 32 | 0719 | 0691 | 0662 | 0634 | 0607 | 0579 | 0551 | 0524 | 0497 | 0470 |
| 33 | 0719 | 0690 | 0662 | 0634 | 0606 | 0579 | 0551 | 0524 | 0497 | 0470 |
| 34 | 0718 | 0690 | 0662 | 0634 | 0606 | 0578 | 0551 | 0523 | 0496 | 0469 |
| 35 | 0718 | 0689 | 0661 | 0633 | 0605 | 0578 | 0550 | 0523 | 0496 | 0469 |
| 36 | 0717 | 0689 | 0661 | 0633 | 0605 | 0577 | 0550 | 0522 | 0495 | 0468 |
| 37 | 0717 | 0688 | 0660 | 0632 | 0604 | 0577 | 0549 | 0522 | 0495 | 0468 |
| 38 | 0716 | 0688 | 0660 | 0632 | 0604 | 0576 | 0549 | 0521 | 0494 | 0467 |
| 39 | 0716 | 0687 | 0659 | 0631 | 0603 | 0576 | 0548 | 0521 | 0494 | 0467 |
| 40 | 0715 | 0687 | 0659 | 0631 | 0603 | 0575 | 0548 | 0521 | 0493 | 0466 |
| 41 | 0715 | 0686 | 0658 | 0630 | 0602 | 0575 | 0547 | 0520 | 0493 | 0466 |
| 42 | 0714 | 0686 | 0658 | 0630 | 0602 | 0574 | 0547 | 0520 | 0493 | 0466 |
| 43 | 0714 | 0685 | 0657 | 0629 | 0602 | 0574 | 0546 | 0519 | 0492 | 0465 |
| 44 | 0713 | 0685 | 0657 | 0629 | 0601 | 0573 | 0546 | 0519 | 0492 | 0465 |
| 45 | 0713 | 0685 | 0656 | 0628 | 0601 | 0573 | 0546 | 0518 | 0491 | 0464 |
| 46 | 0712 | 0684 | 0656 | 0628 | 0600 | 0573 | 0545 | 0518 | 0491 | 0464 |
| 47 | 0712 | 0684 | 0655 | 0627 | 0600 | 0572 | 0545 | 0517 | 0490 | 0463 |
| 48 | 0711 | 0683 | 0655 | 0627 | 0599 | 0572 | 0544 | 0517 | 0490 | 0463 |
| 49 | 0711 | 0683 | 0655 | 0627 | 0599 | 0571 | 0544 | 0516 | 0489 | 0462 |
| 50 | 0711 | 0682 | 0654 | 0626 | 0598 | 0571 | 0543 | 0516 | 0489 | 0462 |
| 51 | 0710 | 0682 | 0654 | 0626 | 0598 | 0570 | 0543 | 0516 | 0489 | 0462 |
| 52 | 0710 | 0681 | 0653 | 0625 | 0597 | 0570 | 0542 | 0515 | 0488 | 0461 |
| 53 | 0709 | 0681 | 0653 | 0625 | 0597 | 0569 | 0542 | 0515 | 0488 | 0461 |
| 54 | 0709 | 0680 | 0652 | 0624 | 0596 | 0569 | 0541 | 0514 | 0487 | 0460 |
| 55 | 0708 | 0680 | 0652 | 0624 | 0596 | 0568 | 0541 | 0514 | 0487 | 0460 |
| 56 | 0708 | 0679 | 0651 | 0623 | 0596 | 0568 | 0541 | 0513 | 0486 | 0459 |
| 57 | 0707 | 0679 | 0651 | 0623 | 0595 | 0568 | 0540 | 0513 | 0486 | 0459 |
| 58 | 0707 | 0678 | 0650 | 0622 | 0595 | 0567 | 0540 | 0512 | 0485 | 0458 |
| 59 | 0706 | 0678 | 0650 | 0622 | 0594 | 0567 | 0539 | 0512 | 0485 | 0458 |
| 60 | 0706 | 0678 | 0649 | 0621 | 0594 | 0566 | 0539 | 0512 | 0484 | 0458 |



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| " | h. ° ' 2. 42 | h. ° ' 2. 43 | h. ° ' 2. 44 | h. ° ' 2. 45 | h. ° ' 2. 46 | h. ° ' 2. 47 | h. ° ' 2. 48 | h. ° ' 2. 49 | h. ° ' 2. 50 | h. ° ' 2. 51 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0458 | 0431 | 0404 | 0378 | 0352 | 0326 | 0300 | 0274 | 0248 | 0223 |
| 1 | 0457 | 0430 | 0404 | 0377 | 0351 | 0325 | 0299 | 0273 | 0248 | 0222 |
| 2 | 0457 | 0430 | 0403 | 0377 | 0351 | 0325 | 0299 | 0273 | 0247 | 0222 |
| 3 | 0456 | 0430 | 0403 | 0377 | 0350 | 0324 | 0298 | 0273 | 0247 | 0221 |
| 4 | 0456 | 0429 | 0402 | 0376 | 0350 | 0324 | 0298 | 0272 | 0246 | 0221 |
| 5 | 0455 | 0429 | 0402 | 0376 | 0349 | 0323 | 0297 | 0272 | 0246 | 0221 |
| 6 | 0455 | 0428 | 0402 | 0375 | 0349 | 0323 | 0297 | 0271 | 0246 | 0220 |
| 7 | 0454 | 0428 | 0401 | 0375 | 0349 | 0322 | 0297 | 0271 | 0245 | 0220 |
| 8 | 0454 | 0427 | 0401 | 0374 | 0348 | 0322 | 0296 | 0270 | 0245 | 0219 |
| 9 | 0454 | 0427 | 0400 | 0374 | 0348 | 0322 | 0296 | 0270 | 0244 | 0219 |
| 10 | 0453 | 0426 | 0400 | 0373 | 0347 | 0321 | 0295 | 0270 | 0244 | 0218 |
| 11 | 0453 | 0426 | 0399 | 0373 | 0347 | 0321 | 0295 | 0269 | 0244 | 0218 |
| 12 | 0452 | 0426 | 0399 | 0373 | 0346 | 0320 | 0294 | 0269 | 0243 | 0218 |
| 13 | 0452 | 0425 | 0399 | 0372 | 0346 | 0320 | 0294 | 0268 | 0243 | 0217 |
| 14 | 0451 | 0425 | 0398 | 0372 | 0346 | 0319 | 0294 | 0268 | 0242 | 0217 |
| 15 | 0451 | 0424 | 0398 | 0371 | 0345 | 0319 | 0293 | 0267 | 0242 | 0216 |
| 16 | 0450 | 0424 | 0397 | 0371 | 0345 | 0319 | 0293 | 0267 | 0241 | 0216 |
| 17 | 0450 | 0423 | 0397 | 0370 | 0344 | 0318 | 0292 | 0267 | 0241 | 0216 |
| 18 | 0450 | 0423 | 0396 | 0370 | 0344 | 0318 | 0292 | 0266 | 0241 | 0215 |
| 19 | 0449 | 0422 | 0396 | 0370 | 0343 | 0317 | 0291 | 0266 | 0240 | 0215 |
| 20 | 0449 | 0422 | 0395 | 0369 | 0343 | 0317 | 0291 | 0265 | 0240 | 0214 |
| 21 | 0448 | 0422 | 0395 | 0369 | 0342 | 0316 | 0291 | 0265 | 0239 | 0214 |
| 22 | 0448 | 0421 | 0395 | 0368 | 0342 | 0316 | 0290 | 0264 | 0239 | 0213 |
| 23 | 0447 | 0421 | 0394 | 0368 | 0342 | 0316 | 0290 | 0264 | 0238 | 0213 |
| 24 | 0447 | 0420 | 0394 | 0367 | 0341 | 0315 | 0289 | 0264 | 0238 | 0213 |
| 25 | 0446 | 0420 | 0393 | 0367 | 0341 | 0315 | 0289 | 0263 | 0238 | 0212 |
| 26 | 0446 | 0419 | 0393 | 0366 | 0340 | 0314 | 0288 | 0263 | 0237 | 0212 |
| 27 | 0446 | 0419 | 0392 | 0366 | 0340 | 0314 | 0288 | 0262 | 0237 | 0211 |
| 28 | 0445 | 0418 | 0392 | 0366 | 0339 | 0313 | 0288 | 0262 | 0236 | 0211 |
| 29 | 0445 | 0418 | 0391 | 0365 | 0339 | 0313 | 0287 | 0261 | 0236 | 0210 |
| 30 | 0444 | 0418 | 0391 | 0365 | 0339 | 0313 | 0287 | 0261 | 0235 | 0210 |

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| " | h. ° ′ 2. 42 | h. ° ′ 2. 43 | h ° ′ 2. 44 | h ° ′ 2. 45 | h. ° ′ 2. 46 | h. ° ′ 2. 47 | h ° ′ 2. 48 | h. ° ′ 2. 49 | h. ° ′ 2. 50 | h. ° ′ 2. 51 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 0444 | 0417 | 0391 | 0364 | 0338 | 0312 | 0286 | 0261 | 0235 | 0210 |
| 32 | 0443 | 0417 | 0390 | 0364 | 0338 | 0312 | 0286 | 0260 | 0235 | 0209 |
| 33 | 0443 | 0416 | 0390 | 0363 | 0337 | 0311 | 0285 | 0260 | 0234 | 0209 |
| 34 | 0442 | 0416 | 0389 | 0363 | 0337 | 0311 | 0285 | 0259 | 0234 | 0208 |
| 35 | 0442 | 0415 | 0389 | 0363 | 0336 | 0310 | 0285 | 0259 | 0233 | 0208 |
| 36 | 0442 | 0415 | 0388 | 0362 | 0336 | 0310 | 0284 | 0258 | 0233 | 0208 |
| 37 | 0441 | 0414 | 0388 | 0362 | 0336 | 0310 | 0284 | 0258 | 0232 | 0207 |
| 38 | 0441 | 0414 | 0388 | 0361 | 0335 | 0309 | 0283 | 0258 | 0232 | 0207 |
| 39 | 0440 | 0414 | 0387 | 0361 | 0335 | 0309 | 0283 | 0257 | 0232 | 0206 |
| 40 | 0440 | 0413 | 0387 | 0360 | 0334 | 0308 | 0282 | 0257 | 0231 | 0206 |
| 41 | 0439 | 0413 | 0386 | 0360 | 0334 | 0308 | 0282 | 0256 | 0231 | 0205 |
| 42 | 0439 | 0412 | 0386 | 0359 | 0333 | 0307 | 0282 | 0256 | 0230 | 0205 |
| 43 | 0438 | 0412 | 0385 | 0359 | 0333 | 0307 | 0281 | 0255 | 0230 | 0205 |
| 44 | 0438 | 0411 | 0385 | 0359 | 0332 | 0306 | 0281 | 0255 | 0230 | 0204 |
| 45 | 0438 | 0411 | 0384 | 0358 | 0332 | 0306 | 0280 | 0255 | 0229 | 0204 |
| 46 | 0437 | 0410 | 0384 | 0358 | 0332 | 0306 | 0280 | 0254 | 0229 | 0203 |
| 47 | 0437 | 0410 | 0384 | 0357 | 0331 | 0305 | 0279 | 0254 | 0228 | 0203 |
| 48 | 0436 | 0410 | 0383 | 0357 | 0331 | 0305 | 0279 | 0253 | 0228 | 0202 |
| 49 | 0436 | 0409 | 0383 | 0356 | 0330 | 0304 | 0279 | 0253 | 0227 | 0202 |
| 50 | 0435 | 0409 | 0382 | 0356 | 0330 | 0304 | 0278 | 0252 | 0227 | 0202 |
| 51 | 0435 | 0408 | 0382 | 0356 | 0329 | 0304 | 0278 | 0252 | 0227 | 0201 |
| 52 | 0434 | 0408 | 0381 | 0355 | 0329 | 0303 | 0277 | 0252 | 0226 | 0201 |
| 53 | 0434 | 0407 | 0381 | 0355 | 0329 | 0303 | 0277 | 0251 | 0226 | 0200 |
| 54 | 0434 | 0407 | 0381 | 0354 | 0328 | 0302 | 0276 | 0251 | 0225 | 0200 |
| 55 | 0433 | 0406 | 0380 | 0354 | 0328 | 0302 | 0276 | 0250 | 0225 | 0200 |
| 56 | 0433 | 0406 | 0380 | 0353 | 0327 | 0301 | 0276 | 0250 | 0224 | 0199 |
| 57 | 0432 | 0406 | 0379 | 0353 | 0327 | 0301 | 0275 | 0250 | 0224 | 0199 |
| 58 | 0432 | 0405 | 0379 | 0352 | 0326 | 0300 | 0275 | 0249 | 0224 | 0198 |
| 59 | 0431 | 0405 | 0378 | 0352 | 0326 | 0300 | 0274 | 0249 | 0223 | 0198 |
| 60 | 0431 | 0404 | 0378 | 0352 | 0326 | 0300 | 0274 | 0248 | 0223 | 0197 |

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| " | h. ° ′ 2. 52 | h. ° ′ 2. 53 | h. ° ′ 2. 54 | h. ° ′ 2. 55 | h. ° ′ 2. 56 | h. ° ′ 2. 57 | h. ° ′ 2. 58 | h. ° ′ 2. 59 |
|---|---|---|---|---|---|---|---|---|
| 0 | 0197 | 0172 | 0147 | 0122 | 0098 | 0073 | 0049 | 0024 |
| 1 | 0197 | 0172 | 0147 | 0122 | 0097 | 0073 | 0048 | 0024 |
| 2 | 0197 | 0171 | 0146 | 0121 | 0097 | 0072 | 0048 | 0023 |
| 3 | 0196 | 0171 | 0146 | 0121 | 0096 | 0072 | 0047 | 0023 |
| 4 | 0196 | 0171 | 0146 | 0121 | 0096 | 0071 | 0047 | 0023 |
| 5 | 0195 | 0170 | 0145 | 0120 | 0096 | 0071 | 0046 | 0022 |
| 6 | 0195 | 0170 | 0145 | 0120 | 0095 | 0071 | 0046 | 0022 |
| 7 | 0194 | 0169 | 0144 | 0119 | 0095 | 0070 | 0046 | 0021 |
| 8 | 0194 | 0169 | 0144 | 0119 | 0094 | 0070 | 0045 | 0021 |
| 9 | 0194 | 0169 | 0143 | 0119 | 0094 | 0069 | 0045 | 0021 |
| 10 | 0193 | 0168 | 0143 | 0118 | 0093 | 0069 | 0044 | 0020 |
| 11 | 0193 | 0168 | 0143 | 0118 | 0093 | 0068 | 0044 | 0020 |
| 12 | 0192 | 0167 | 0142 | 0117 | 0093 | 0068 | 0044 | 0019 |
| 13 | 0192 | 0167 | 0142 | 0117 | 0092 | 0068 | 0043 | 0019 |
| 14 | 0192 | 0166 | 0141 | 0117 | 0092 | 0067 | 0043 | 0018 |
| 15 | 0191 | 0166 | 0141 | 0116 | 0091 | 0067 | 0042 | 0018 |
| 16 | 0191 | 0166 | 0141 | 0116 | 0091 | 0066 | 0042 | 0018 |
| 17 | 0190 | 0165 | 0140 | 0115 | 0091 | 0066 | 0042 | 0017 |
| 18 | 0190 | 0165 | 0140 | 0115 | 0090 | 0066 | 0041 | 0017 |
| 19 | 0189 | 0164 | 0139 | 0114 | 0090 | 0065 | 0041 | 0016 |
| 20 | 0189 | 0164 | 0139 | 0114 | 0089 | 0065 | 0040 | 0016 |
| 21 | 0189 | 0163 | 0139 | 0114 | 0089 | 0064 | 0040 | 0016 |
| 22 | 0188 | 0163 | 0138 | 0113 | 0089 | 0064 | 0040 | 0015 |
| 23 | 0188 | 0163 | 0138 | 0113 | 0088 | 0064 | 0039 | 0015 |
| 24 | 0187 | 0162 | 0137 | 0112 | 0088 | 0063 | 0039 | 0015 |
| 25 | 0187 | 0162 | 0137 | 0112 | 0087 | 0063 | 0038 | 0014 |
| 26 | 0186 | 0161 | 0136 | 0112 | 0087 | 0062 | 0038 | 0014 |
| 27 | 0186 | 0161 | 0136 | 0111 | 0087 | 0062 | 0038 | 0013 |
| 28 | 0186 | 0161 | 0136 | 0111 | 0086 | 0062 | 0037 | 0013 |
| 29 | 0185 | 0160 | 0135 | 0110 | 0086 | 0061 | 0037 | 0012 |
| 30 | 0185 | 0160 | 0135 | 0110 | 0085 | 0061 | 0036 | 0012 |

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| " | h. ° ′ 2. 52 | h. ° ′ 2. 53 | h. ° ′ 2. 54 | h. ° ′ 2. 55 | h. ° ′ 2. 56 | h. ° ′ 2. 57 | h. ° ′ 2. 58 | h. ° ′ 2. 59 |
|---|---|---|---|---|---|---|---|---|
| 31 | 0184 | 0159 | 0134 | 0110 | 0085 | 0060 | 0036 | 0012 |
| 32 | 0184 | 0159 | 0134 | 0109 | 0084 | 0060 | 0035 | 0011 |
| 33 | 0184 | 0158 | 0134 | 0109 | 0084 | 0060 | 0035 | 0011 |
| 34 | 0183 | 0158 | 0133 | 0108 | 0084 | 0059 | 0035 | 0010 |
| 35 | 0183 | 0158 | 0133 | 0108 | 0083 | 0059 | 0034 | 0010 |
| 36 | 0182 | 0157 | 0132 | 0107 | 0083 | 0058 | 0034 | 0010 |
| 37 | 0182 | 0157 | 0132 | 0107 | 0082 | 0058 | 0033 | 0009 |
| 38 | 0181 | 0156 | 0131 | 0107 | 0082 | 0057 | 0033 | 0009 |
| 39 | 0181 | 0156 | 0131 | 0106 | 0082 | 0057 | 0033 | 0008 |
| 40 | 0181 | 0156 | 0131 | 0106 | 0081 | 0057 | 0032 | 0008 |
| 41 | 0180 | 0155 | 0130 | 0105 | 0081 | 0056 | 0032 | 0008 |
| 42 | 0180 | 0155 | 0130 | 0105 | 0080 | 0056 | 0031 | 0007 |
| 43 | 0179 | 0154 | 0129 | 0105 | 0080 | 0055 | 0031 | 0007 |
| 44 | 0179 | 0154 | 0129 | 0104 | 0080 | 0055 | 0031 | 0006 |
| 45 | 0179 | 0153 | 0129 | 0104 | 0079 | 0055 | 0030 | 0006 |
| 46 | 0178 | 0153 | 0128 | 0103 | 0079 | 0054 | 0030 | 0006 |
| 47 | 0178 | 0153 | 0128 | 0103 | 0078 | 0054 | 0029 | 0005 |
| 48 | 0177 | 0152 | 0127 | 0103 | 0078 | 0053 | 0029 | 0005 |
| 49 | 0177 | 0152 | 0127 | 0102 | 0077 | 0053 | 0029 | 0004 |
| 50 | 0176 | 0151 | 0126 | 0102 | 0077 | 0053 | 0028 | 0004 |
| 51 | 0176 | 0151 | 0126 | 0101 | 0077 | 0052 | 0028 | 0004 |
| 52 | 0176 | 0151 | 0126 | 0101 | 0076 | 0052 | 0027 | 0003 |
| 53 | 0175 | 0150 | 0125 | 0100 | 0076 | 0051 | 0027 | 0003 |
| 54 | 0175 | 0150 | 0125 | 0100 | 0075 | 0051 | 0027 | 0002 |
| 55 | 0174 | 0149 | 0124 | 0100 | 0075 | 0051 | 0026 | 0002 |
| 56 | 0174 | 0149 | 0124 | 0099 | 0075 | 0050 | 0026 | 0002 |
| 57 | 0174 | 0148 | 0124 | 0099 | 0074 | 0050 | 0025 | 0001 |
| 58 | 0173 | 0148 | 0123 | 0098 | 0074 | 0049 | 0025 | 0001 |
| 59 | 0173 | 0148 | 0123 | 0098 | 0073 | 0049 | 0025 | 0000 |
| 60 | 0172 | 0147 | 0122 | 0098 | 0073 | 0049 | 0024 | 0000 |

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# EXPLICATION and USE

OF THE

# TABLES

Requiſite to be uſed with the ASTRONOMICAL and NAUTICAL EPHEMERIS.

THE Rays of Light in paſſing through the Atmoſphere being bent out of their ſtrait Courſe into a curved Line, it thence happens that all the heavenly Bodies, except when they are in the Zenith, appear higher than they ought to do, and ſo much the more, the nearer they are to the Horizon. Hence they appear to riſe ſome Minutes ſooner, and ſet ſome Minutes later than they would do, if there was no Atmoſphere, or if it had not this Power of turning the Rays of Light out of their Courſe. This apparent Elevation of the heavenly Bodies above their true Height is called the Refraction of their Light, or, in common Speaking, the Refraction of the Objects. The Effect of it is contained in Table Page 2d. and is ſuited to a mean Temperature of the Air at Greenwich; the Height of the Barometer being 29$\frac{6}{10}$ Inches, and that of the Thermometer of Fahrenheit's Conſtruction 50 Degrees; or, which comes to the ſame Thing, 30 Inches of the Barometer, and 55 of the Thermometer. It is deduced from a Rule invented by Dr. Bradley, and by him adapted to his Obſervations, that the Refraction at any Altitude, is to 57″, the Refraction at the Altitude of 45°; as the Tangent of the apparent Zenith Diſtance leſſened by three times the



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Refraction taken out of any common Table, is to the Radius. To allow for the Variations of Refraction in different Temperatures of the Air, he has ſtated another Rule, derived alſo from or confirmed by his Obſervations, that the true Refraction is to that expreſſed by his firſt Rule, or contained in this Table, in a direct Ratio of the Altitude of the Barometer to $29\frac{6}{10}$ Inches; and in an Inverſe Ratio of the Altitude of the Thermometer increaſed by 350, to the Number 400.

It is evident that all obſerved Altitudes of the heavenly Bodies ought to be diminiſhed by the Numbers taken out of this Table, particularly the Meridian Altitudes of the Sun and Stars, &c. the Altitudes of the Sun and Stars deſigned for computing the apparent Time of the Day, and the Altitudes of the Sun taken for computing his Azimuth. The Time for taking an Amplitude of the Sun is not when he appears in the Horizon, but when his Centre appears 29′ high, or his lower Limb 15′, or upper Limb 43′ above the true Horizon; but the Quantity of the Dip, p. 14. is to be added to theſe Numbers to find the apparent Altitudes above the viſible Horizon of the Sea.

The Moon's Parallax is the Difference between her Place in the Heavens ſeen from the Surface of the Earth, and that in which ſhe would be ſeen from the Centre, which laſt is called her true Place, and is that which is given directly by Aſtronomical Tables. On this Account the Moon, except when in the Zenith, always appears lower than her true Altitude; the Quantity of this Depreſſion, called the Moon's Parallax in Altitude, is contained in Table p. 3, 4, 5. and is to be added to all obſerved Altitudes of the Moon. It is uſeful in finding the Latitude from the Moon's Meridian Altitude, the apparent Time from the obſerved Altitude of the Moon at a Diſtance from the Meridian, and in computing her apparent Altitude from her right Aſcenſion and Declination, the Hour being given; but in this laſt Caſe the true Altitude being firſt found, the Parallax muſt be ſubſtracted from it to obtain the apparent Altitude.

It

It is likewiſe uſeful in computing the ſecond Correction of Parallax delivered in the Preface to the Britiſh Mariner's Guide, which may alſo be conſulted for the Application of the abovementioned Uſes of the Moon's Parallax. Mr. Lyon's Tab. IV. of Parallax, deſigned for facilitating the Computation of the ſecond Correction of Parallax, requires alſo the Table of the Uſe of the Moon's Parallaxes.

The Table, p. 6, 7, and 8, ſerves to turn Degrees and Minutes of the Equator into Time, and the contrary; it is of frequent Uſe, as has been ſhewn already in the Explication of the Ephemeris. It is alſo uſeful to find the true Difference of Longitude between Greenwich and any Place, from the Difference of Meridians found in Time by the Obſervation of the Moon's Diſtance from the Sun or a Star, as will be explained hereafter.

Page 9th contains the Longitudes and Latitudes of 19 of the brighteſt Stars and neareſt the Ecliptic, being ſuch as are moſt proper to take the Moon's Diſtance from for finding the Longitude at Sea; and therefore it would be better in general not to uſe any others. The 10 marked with Aſteriſks are the only ones made uſe of in the Diſtances of the Ephemeris. This Table is derived from a larger Table of 46 Stars communicated to me by Mr. Gael Morris, deduced from Dr. Bradley's Obſervations, and adapted to the Year 1760. The Longitude of the Stars in this Table being adapted to the Beginning of the Year 1767, muſt be increaſed by the proportional Part of $50''\frac{1}{4}$, the annual Variation, for any Day of the Year, according to the Number of Days from the Beginning of the Year, which may be found in the laſt Column of the mean Motion of the Sun for the Days of the Month, p. 13—18 in Mayer's Tables: They muſt alſo be increaſed at the Rate of $50''\frac{1}{4}$ for every Year after 1767; and muſt further be corrected by the Number of Seconds taken out of the following Table, intitled, Table to find the Aberration of a Zodiacal Star in Longitude, communicated alſo by Mr. Gael Morris. To find the Argument or Number for entering this Table with, ſubſtract the Longitude of the Star from the Longitude of the Sun, borrowing 12 Signs if neceſ-



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ſary; where note, that the Character + affixed to the Sign of the Argument, ſhews that the Number of Seconds is to be added; and − ſhews that it is to be ſubtracted; and when the Number of Signs is found at the Bottom of the Table, the Degrees are to be looked for to the right Hand of the Table. The Aberration of Light is an apparent Motion to which all the fixed Stars are ſubject, the Period of which is completed in a Year. It was firſt diſcovered by Dr. Bradley in the Year 1727, and ſhewn by him to ariſe from the ſucceſſive Propagation of Light, and the Motion of the Earth in its Orbit, compounded together. Laſtly, the Longitudes of the Stars muſt be corrected by the Equation of the Equinoctial Points, which is ſet down for every three Months at the Beginning of the Ephemeris, whence it may be taken at Sight, and applied according to its Sign. This Equation ariſes from the Nutation of the Earth's Axis, which is owing to the Action of the Moon upon the protuberant Parts of the Earth about the Equator, combined with the Inclination of the Moon's Orbit to the Ecliptic, and the entire Revolution of its Nodes in 18½ Years. This was alſo diſcovered by Dr. Bradley, by the like Obſervations by which he found the Aberration, continued for a Series of twenty Years.

The Moon's Velocity of Acceſs or Receſs being greateſt with Reſpect to a Star poſited near the ſame Parallel of Latitude, it is proper to chuſe one out of the 24 Stars contained in Table Page 9th, as near this Situation as poſſible, from which to obſerve the Moon's Diſtance for finding the Longitude at Sea: For, if a Star be taken from which the Moon varies her Diſtance too ſlowly, the unavoidable Errors of Obſervation will produce a proportionably greater Error in the Reſult. The two following Tables, intitled, A Table for chuſing proper Stars for obſerving the Moons Diſtance from, and a particular Table of Limits for, $\alpha$ Aquilæ, are deſigned for this Purpoſe, and were accordingly uſed for chuſing the proper Stars for the Moon's Diſtances in the Ephemeris. The Uſe of

the

the Tables is this, the Difference of the Latitudes of the Moon and Star, if of the same Denomination, viz. both North or both South, or their Sum, if of contrary Denominations, or one North and the other South, being found in the first Column, the Difference of the Longitudes of the Moon and Star should not be less than is shewn against it in the second Column. Or, the Difference of Longitude being found in the second Column, the Difference or Sum of the Latitudes should not be greater than is shewn in the first Column. I have adapted the first Table, so that the Velocity of the Moon's Access to or Recess from a Star may be never less than Seven Eighths of her proper Motion; but, in order to take in so fine a Star as $\alpha$ Aquilæ, in some Cases where there may be a Defect of other bright Stars proper for the Purpose, I have extended the Limits a little further in the second Table, yet so that the Velocity of the Moon's Access to, or Recess from, $\alpha$ Aquilæ, may never be less than $\frac{5}{6}$ of her proper Motion.

The Use of the following Table of Corrections of the Moon's Longitude and Latitude found by even Proportion from the Ephemeris, on account of the second Differences of the Motion in twelve Hours, has been shewn in the Explanation of the Ephemeris, under the Articles of the Moon's Longitude and Latitude.

The next Table of the right Ascensions and Declinations of the principal fixed Stars, is useful for finding the Time and the Latitude by Altitudes taken in the Night; also for computing the Altitude of a Star from which the Moon's Distance was observed, in case it was not observed. The Method of finding the Time from the observed Altitude of a Star will be shewn in the Precepts for finding the Longitude at Sea by the Help of the Ephemeris. It is also shewn in the British Mariner's Guide, Chap. iii. Page 19, which also consult at Page 57 and 92, for the two other Uses of the Catalogue of right Ascensions and Declinations, mentioned above.



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2 If the right Aſcenſions of the Stars are required for any Year after 1767, the right Aſcenſions in the Table muſt be increaſed in proportion to the Number of Years after 1767, according to the Increaſe of right Aſcenſion in Ten Years ſet down in Column the fourth: In like manner the Declinations muſt be corrected according to the Variation of Declination into Years, ſet down in the laſt Column, the Sign + denoting when the Correction is to be added, and the Sign — when it is to be ſubſtracted.

If the right Aſcenſion and Declination are required for any Year before 1767, they are found by diminiſhing the right Aſcenſion contained in the Table, according to the Number of Years which precede 1767, and by applying the Correction of Declination with a contrary Sign to that ſhewn by the Table.

This Table, as well as the Table of Multipliers, p. 14, is taken from the Britiſh Mariner's Guide, which conſult at Page 49 for the Uſe of the latter Table.

The following Table of the Depreſſion or Dip of the Horizon of the Sea is more correct than the common Tables, the Numbers in it being One Tenth Part leſs than in them. This Correction is owing to the Refraction of the Rays of Light in paſſing from the Horizon through the Air to the Eye; and I find it confirmed by Experiment, as well as by Theory. All Altitudes taken from the apparent Horizon of the Sea are to be leſſened by the Numbers taken out of this Table, according to the Height of the Eye above the Sea.

The Tables of the right Aſcenſions, Declinations, Longitudes, and Latitudes of 21 principal fixed Stars, deduced from Dr. Bradley's Obſervations, were communicated by the Reverend Mr. Hornſby, Savilian Profeſſor of Aſtronomy at Oxford. They may be preſumed to be very exact, being ſettled from Ten Years Obſervations, made between the Years 1750 and 1760; and are fit for the nicer Inquiries of Aſtronomy. The Longitudes and Latitudes of 24 Stars, contained p. 9, are moſtly the ſame with theſe p. 16. to the neareſt Second, being both carried on

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from the ſame Settlement of the Stars made to the Beginning of the Year 1760.

Next follow Mr. Lyon's Tables and Rules, and Mr. Dunthorne's Tables, for correcting the apparent Diſtance of the Moon from the Sun or a fixed Star, on account of Refraction and Parallax, the Explanation and Uſe of which, with Examples, is immediately ſubjoined to the Tables themſelves.

THE

EXPLICATION

# EXPLICATION and USE

OF THE

# TABLE

OF

## PROPORTIONAL LOGARITHMS.

THE apparent Diſtance of the Moon from the Sun, or a fixed Star, being carefully obſerved and reduced to the true Diſtance by the preceding Tables and Rules, it is manifeſt that the Problem of finding the Longitude from Greenwich is reducible to this, to find the apparent Time of the Obſervation by the Meridian of Greenwich; for, the Time at the Ship being given, the Difference of theſe Two is the Difference of Longitude in Time. The apparent Time at Greenwich is to be found by comparing the obſerved Diſtance reduced with the Diſtances of the Moon from the Sun or the ſame Star ſet down in the Ephemeris, for every Three Hours by the Meridian of Greenwich, and making the following Proportion; as the Variation of the Moon's Diſtance in three Hours by the Ephemeris : is to the Difference of the reduced Diſtance, and the next preceding Diſtance in the Ephemeris : : ſo is three Hours or 180′ : to the Number of Hours, Minutes, &c. which added to the Hour ſtanding at the Top of the Column above the next preceding Diſtance, gives the apparent Time of the Obſervation by the Meridian of Greenwich.

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I have calculated the Table of proportional Logarithms, as I term them, principally in order to render the Operation of this Proportion more easy. It is analogous to a Table of Logistical Logarithms, but three times as large, being continued up to 3° or Three Hours, on account of the Distances being set down in the Ephemeris at such Intervals. Nothing more is to be done than to enter the Table with the Variation of Distance in Three Hours, looking for the Degree and Minute at Top, and Seconds on the Side, and take out the proportional Logarithm; in like manner to take out the proportional Logarithm of the Difference of the reduced Distance and next preceding Distance in the Ephemeris; the Difference of these Two Logarithms will be the proportional Logarithm of the Hours, Minutes, and Seconds, which being found in the Table, and added to the Hour of the next preceding Distance, gives the apparent Time by the Meridian at Greenwich. This will be further explained and illustrated by an Example among the Precepts for finding the Longitude at Sea by the Help of the Ephemeris.

The Table of proportional Logarithms is also very useful in facilitating the Computation of the Effect of Parallax upon the Moon's Distance from a Star by Mr. Lyon's Rules, as has been shewn in their Explication at the End of his Tables.

Wherever any Proportion is to be worked, and all the Three given Terms are Sexagesimals, that is to say, Degrees, Minutes, and Seconds, Hours, Minutes, and Seconds, &c. the Answer is readily found by adding the proportional Logarithms of the second and third Terms, together with the arithmetical Complement of the proportional Logarithm of the first Term; the Sum will be the proportional Logarithm of the fourth Term required. If one of the given Terms is Three Degrees, or Three Hours, whose proportional Logarithm is 0, the Result is had by only adding Two Numbers together, as in the Case first mentioned of finding the Time at Greenwich from the reduced Distance by the Help of the Ephemeris.



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If the Two first Terms in the Proportion are common Numbers, and the Third a Sexagesimal, add the proportional Logarithm of the Third Term to the common Logarithm of the First Term, and the arithmetical Complement of the common Logarithm of the Second Term, the Sum will be the proportional Logarithm of the Fourth Term required.

Or, if the Two First Terms are Sexagesimals, and the Third a common Number to the common Logarithm of the Third Term, add the proportional Logarithm of the First Term, and the arithmetical Complement of the proportional Logarithm of the Second Term, the Sum will be the common Logarithm of the Number required.

To multiply a Sexagesimal by any common Number, or by a Sine, Tangent, &c. to the proportional Logarithm of the Sexagesimal, add the arithmetical Complement of the Logarithm of the common Number, or of the logarithmic Sine, Tangent, &c. the Sum will be the proportional Logarithm of the Product required.

The Division of a Sexagesimal will be performed by adding together the proportional Logarithm of the Sexagesimal and the common Logarithm of the Divisor, the Sum will be the proportional Logarithm of the Quotient required.

The proportional Logarithms were found by subtracting the Logarithm of any Number of Seconds from 4.03342, the Logarithm of 10800, the Number of Seconds contained in 3° or Three Hours.

I shall now shew, and illustrate by an Example, the Manner in which the Moon's Longitude or Latitude may be readily found from the Ephemeris by the Help of this Table. Take half the Increase of the Moon's Longitude in Twelve Hours, or the Motion in Six Hours, and again take its Half or the Motion in Three Hours. To the proportional Logarithm of the Moon's Motion in Three Hours, add the proportional Logarithm of the Excess of the Time, reckoned from Noon or Midnight, above Three, Six, or Nine Hours, which ever is the next below it, the Sum will

will be the proportional Logarithm of the Degree, Minutes, and Seconds, which added to the Moon's Longitude at the preceding Noon or Midnight, together with the Motion in Three Hours, Six Hours, or the Motions in Three Hours and Six Hours, taken together, gives the Moon's Longitude at the given Time by even Proportion: This muſt be corrected on account of the Second Differences in the Manner ſhewn in treating of the Article of the Moon's Longitude.

## EXAMPLE.

Let it be required to find the Moon's Longitude and Latitude July 16th 1767, at 16 H. 22 M. 16 S. by the Help of the Ephemeris. July 16th at 12 H. the Moon's Longitude is 0. S. 6°. 40′. 25″. and July 17th at Noon, 0. S. 13°. 47′. 48″. the Difference 7°. 7′. 23″. is the Moon's Motion in 12 Hours; its Half, or 3°. 33′. 41″½. is the Motion in 6 Hours; and its Half again, or 1°. 46′. 51″. is the Motion in 3 Hours. The Time reckoned from Midnight, is, 4 H. 22′. 16″. from which ſubſtracting 3 Hours, there remains 1 H. 22 M. 16 S. Now to 0.2265 the proportional Logarithm of 1°. 46′. 51″. adding 0.3400, the proportional Logarithm of 1 H. 22 M. 16 S. the Sum 0.5665 is the proportional Logarithm of 0°. 48′. 50″. which, together with 1°. 46′. 51″. being added to 0 S. 6°. 40′. 25″. gives 0 S. 9°. 16′. 6″. the Moon's Longitude found by even Proportion: To which add 25″. on account of the Second Differences, and the true Longitude of the Moon will be 0 S. 9°. 16′. 31″. In like manner, to find the Moon's Latitude at the ſame Time, July 16th at Midnight, by the Ephemeris, it is 4°. 49′. 36″. N. and July 17th at Noon 5°. 3′. 26″. N. Therefore the Motion in 12 Hours is 13′. 50″. and in 3 Hours is 3′. 27″. whoſe proportional Logarithm is 1.7175, which added to 0.3400, the proportional Logarithm of 1 H. 22′. 16″. gives 2.0575, the proportional Logarithm of 1′. 34″. which added to 3′. 27″. gives 5′. 1″. but this muſt be corrected by adding



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33″. the Correction of Second Differences, whence the proportional Part corrected, is 5′. 1″. + 33″. = 5′. 34″. which added to 4°. 49′. 36″. gives 4°. 55′. 10″. the true Moon's Latitude correct. See the Example, p. 33 + 37. under the Explanation of the Article of the Moon's Longitude and Latitude.

INSTRUC.

# INSTRUCTIONS

## FOR

# Finding the LONGITUDE at SEA,

## By the Help of the EPHEMERIS.

## ARTICLE I.

### Concerning the INSTRUMENTS and OBSERVATIONS.

THE Obſerver muſt be furniſhed with a good Hadley's Quadrant, and a Watch that can be depended upon for keeping Time within a Minute for ſix Hours. But it will be more convenient if the Inſtrument be made a Sextant, in which Caſe it will meaſure 120°. for the Sake of obſerving the Moon's Diſtance from the Sun, for Two or Three Days after the firſt and before the laſt Quarter. The Inſtrument will be ſtill more fit for the Purpoſe, if it be furniſhed with a Screw to move the Index gradually in meaſuring the Moon's Diſtance from the Sun or Star; an additional dark Glaſs, lighter than the common ones, to take off the Glare of the Moon's Light in obſerving her Diſtance from a fixed Star, and a ſmall Teleſcope magnifying Three or Four Times to render the Contact of the Star with the Moon's Limb more diſcernible. A magnifying Glaſs of 1½ or Two Inches Focus will aſſiſt the Obſerver to read off his Obſervation with greater Eaſe and Certainty.

The greateſt Care muſt be taken in having the Quadrant carefully adjuſted before the Obſervation, or, which I ſhould

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should rather adviſe, in examining the Error of the Adjuſtment, for it is liable to alter, and allowing for it. The Method of doing it is this; turn the Index of the Quadrant till the Horizon of the Sea, or the Moon, or any other proper Object appears as One, by the Union of the reflected Image with the Object ſeen directly; then the Number of Minutes by which o on the Index differs from o on the Arch is the Error of Adjuſtment. If o on the Index ſtands advanced upon the Quadrant before, or to the left Hand of o on the Arch, that Number of Minutes is to be ſubſtracted from all Obſervations; but if it ſtands off the Arch behind, or to the right Hand of o on the Arch, it muſt be added to the Obſervations. But the Sun himſelf is incomparably the beſt Object for this Purpoſe: Either the Two Suns may be brought into One; or, which is a ſtill better Method, the Sun's Diameter may be meaſured twice, with the Index placed alternately before and behind the Beginning of the Diviſions: Half the Difference of theſe Two Meaſures will be the Correction of the Adjuſtment, which muſt be added or ſubſtracted from all Obſervations, as the Diameter meaſured with the Index upon the Arch, that is to ſay, before or to the left Hand of the Beginning of the Diviſions is leſs or greater than the Diameter meaſured with the Index off the Arch, behind, or to the right Hand of the Beginning of the Diviſions. Thus, ſuppoſe I had meaſured the Sun's Diameter with the Index upon the Arch, or to the left Hand of the Beginning of the Diviſions, to be 30′. and the contrary Way to be 33′; I ſhould conclude that the Correction of Adjuſtment is 1½, or Half the Difference 3′ additive to the Obſervations. In the Practice of this Method the Teleſcope muſt be uſed, and a dark Glaſs muſt be applied at the Eye, or at leaſt on the hither Side of the little Speculum, to darken both Suns at once. It will alſo be convenient to provide an Umbrella of Paſteboard, about Six Inches ſquare, with a Hole in the Middle to receive the Teleſcope, in order to defend the Eyes from the direct Light of the Sun, as well as from the

ambient

ambient Brightneſs of the Sky, which would otherwiſe render this Practice in many Caſes too painful and difficult.

It will conduce to greater Exactneſs to take Two or Three Meaſures of the Sun's Diameter each Way, Half the Difference of the Means each Way will be the Correction of the Adjuſtment, to be applied as before. Thus I have often aſſured myſelf of the exact Quantity of Correction of my Quadrant within a Quarter of a Minute.

There is another Adjuſtment of the Quadrant, which is not commonly regarded ſo much as it ought to be, that of ſetting the little Speculum parallel to the great one by the Screws on the Fore-part of the Inſtrument. The Manner of doing it is this; hold the Plane of the Quadrant parallel to the Horizon, and the Index being brought near to 0, if the Horizon of the Sea ſeen by Reflection in the little Speculum is higher than the direct Horizon ſeen by the Side of it, unſcrew the neareſt Screw a little, and ſcrew up the oppoſite one till the direct and reflected Horizons agree. On the contrary, if the reflected Horizon is lower than the true one, unſcrew the Screw furtheſt from you, and ſcrew up the neareſt one; and take care to leave the Screws both tight, by ſcrewing them up equally if they are ſlack. If this Adjuſtment is not above 4′. or 5′. erroneous, it will not be neceſſary to correct it; and it will probably never err more, unleſs the Inſtrument meets with ſome Accident. But for the Sake of Caution it will be proper to examine it from time to time.

The Obſerver being now aſſured of the Adjuſtment of his Quadrant, or the exact Correction of it, may proceed ſafely to the neceſſary Obſervations for aſcertaining the Longitude. The firſt Obſervation to be made, is that of the Altitude of the Sun or ſome bright Star, if the Horizon be fair enough, for computing the apparent Time at the Ship, and correcting the Watch by which the other Obſervations are to be made. Theſe Altitudes muſt not be taken nearer to the Meridian than Three or Four Points; but the nearer they are taken due Eaſt or Weſt the better, provided the Objects be not leſs than 5°. high. The next Obſervation to be made is that of the Diſtance of a Star

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from the Moon's enlightened Limb, or the Diſtance of the neareſt Limbs of the Sun and Moon. The Two other requiſite Obſervations are the Altitudes of the Moon and Star, or of the Moon and Sun, to be taken by Two Aſſiſtants at the very Inſtant, or at the utmoſt within a Minute of the Time at which the principal Obſerver gives Notice of the completing his Obſervation of the Diſtance of the Moon from the Sun or Star. At the ſame Inſtant, or at the utmoſt within a Quarter of a Minute, and before the Obſervers attempt to read off the Degrees and Minutes from their Quadrants, ſomebody muſt note the Hour, Minute, and Quarter Part of a Minute (if there is no ſecond Hand) of the Watch uſed in taking the Sun or Star's Altitude for computing the Time; and the Obſervations requiſite for aſcertaining the Longitude are completed.

If the Moon's Diſtance be taken from the Sun, and the Sun be not nearer to the Meridian than Three Points, and his Altitude be well taken within 15″. or 20″. of the Obſervation of the Diſtance, this Altitude will ſerve to compute the apparent Time, without requiring the Uſe of the ſeparate Obſervation firſt mentioned, except it be uſed by way of Confirmation and Check both upon Obſervation and Calculation.

In taking the Moon's Diſtance from the Sun, the Obſerver muſt look at the Moon directly through the unfoiled Part of the little Speculum, and obſerve the Sun by Reflection, letting down One of the dark Glaſſes uſed in taking his Meridian Altitude. In taking the Moon's Diſtance from a Star, he muſt look at the Star directly, and ſee the Moon by Reflection, uſing the dark Glaſs that is lighter than the Reſt, and deſigned for this particular Purpoſe. The Plane of the Quadrant muſt be always made to paſs through the Two Objects whoſe Diſtance is to be obſerved, and muſt be put into various Poſitions according to the Situations of the Objects, which will be rendered familiar by a little Experience.

In order to attain the greater Degree of Exactneſs, it will be better to repeat the Obſervations till at leaſt Three Diſtances and their correſponding Altitudes are obtained; but

but the more that are taken the better. The Sum of the Diſtances divided by the Number of them is the mean Diſtance: in like manner the mean Altitudes, and the mean Time by the Watch are obtained; which then are to be uſed as a ſingle Obſervation would be, only they may be relied upon with greater Aſſurance. But theſe Obſervations muſt be all included within the Space of Half an Hour.

The Manner of finding the Star, whoſe Diſtance from the Moon is ſet down in the Ephemeris, has been mentioned among the Uſes of the Diſtances contained in the Ephemeris.

Whoever would ſee more concerning the neceſſary Inſtruments and Obſervations, may conſult the Two firſt Chapters of the Britiſh Mariner's Guide, from which moſt of the foregoing Inſtructions are borrowed.

## ARTICLE II.

### To compute the apparent Time from the obſerved Altitude of the Sun or a known Star, and thence to find the apparent Time of the Obſervation of the Diſtance of the Moon from the Sun or a Star.

From the obſerved Altitude of the Sun's lower Limb, ſubſtract the Sum of the Dip and Refraction, taken out of Page 2d and 10th of requiſite Tables, and to the Remainder add 16′. for the Sun's Semidiameter (or if you have a mind to be more exact, make uſe of the Sun's Semidiameter, ſhewn Page 3d of the Month in the Ephemeris) and you have the true Altitude of the Sun's Centre. If the Sun's upper Limb was obſerved, his Semidiameter muſt be ſubſtracted inſtead of being added. If the Altitude of his Centre was taken, it is only neceſſary to ſubſtract the Sum of the Dip and Refraction. Subſtract the true Altitude of the Sun thus found from 90°. and you have his true Zenith Diſtance.



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The Sun's Declination is to be found from the Ephemeris, Page 2d of the Month; but being there ſet down for apparent Noon at Greenwich, Proportion muſt be made to find what it ſhould be at the given Time reduced to the Meridian of Greenwich. Turn your Longitude by Account from London or Greenwich into Time, by Table Page 6, 7, and 8, which add to, or ſubſtract from, the Time at the Ship, eſtimated nearly according as you are to the Weſt or to the Eaſt of Greenwich: This gives the Time at Greenwich. Then ſay, as 24 H. is to this Time, ſo is the daily Variation of the Sun's Declination in the Ephemeris to a Number of Minutes, &c. which added to, or ſubſtracted from, the Sun's Declination, at the preceding Noon in the Ephemeris, according as his Declination is increaſing or decreaſing, gives his true Declination required. Note, that the Sun's Declination may be found in the ſame Manner for computing his Azimuth, to compare with his obſerved Azimuth in order to find the Variation of the Compaſs. The Sun's Declination, if of the ſame Denomination with the Latitude of the Place (viz. both North or both South) muſt be ſubſtracted from 90°. but if of a contrary Denomination to the Latitude of the Place (viz. one North and the other South) muſt be added to 90°. the Sum or Difference is the Diſtance of the Sun from the Pole of the World which is above the Horizon. Find alſo the Latitude of the Ship, at the Time of taking the Altitude of the Sun, by allowing for the Ship's Run from the Latitude determined at the neareſt Meridian Obſervation before or after: The Complement to 90°. is the Co-Latitude.

Now add together the Zenith Diſtance, Polar Diſtance, and Co-Latitude, and take Half the Sum, and the Difference between the Half Sum and the Zenith Diſtance: Then add the Sines of the Half Sum and the ſaid Difference, together with the arithmetical Complements of the Sines of the Polar Diſtance and Co-Latitude, Half the Sum of theſe Four Logarithms is the Coſine of Half the horary Angle; which therefore doubled gives the horary Angle or true Diſtance of the Sun from the Meridian. This being turned into Time

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Time by Table Page 6, 7, and 8, gives the apparent Time if it be Afternoon; but, if it be Forenoon, the Complement to Twenty-four Hours is the apparent Time reckoned from the preceding Noon. Five Places of Logarithms, beſides the Index, will be ſufficient for this Computation.

The Difference between the apparent Time thus found, and the Time ſhewn by the Watch at the Inſtant of taking the Altitude, ſhews how much the Watch is too faſt or too ſlow; which Difference being applied as a Correction to the Time ſhewn by the Watch when the Diſtance of the Moon from the Sun or Star was taken, being added thereto, if the Watch is too ſlow, or ſubſtracted therefrom, if the Watch is too faſt, gives the apparent Time of the Obſervation of the Diſtance.

## EXAMPLE.

Suppoſe the apparent Altitude of the Sun's lower Limb above the Horizon of the Sea ſhould be obſerved April 4th 1767 to be 47°. 13′. the Height of the Eye above the Sea being 18 Feet; the Latitude of the Ship at the ſame time corrected for the Run from the preceding Noon, being 16°. 24′. North, the Longitude to the ſame Time by the Ship's Reckoning 43°. 37′. Weſt of Greenwich, and the Time at the Ship eſtimated nearly 2 H. 41 M. It is required to find the apparent Time?

| | | |
|---|---|---|
| Obſerved Altitude of the Sun's lower Limb | 47°. | 13′. |
| Sum of Dip 4′. and Refract. 1′. ſubſtract | | 5 |
| | 47. | 8 |
| Sun's Semidiameter, add — — | | 16 |
| True Atitude of Sun's Centre — | 47. | 24 |
| Subſtract from — — — | 90 | |
| True Zenith Diſtance of the Sun — | 42°. | 36′. |



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| | H. | M. | |
|---|---|---|---|
| Time from Noon eſtimated nearly —— | 2 | 41 | |
| Long. W. of Greenwich *per* Acc. 43°. 37′. = | 2 | 54 | 28 |
| App. Time at Greenwich nearly —— | 5 | 35 | |

The Sun's Declination April 4th at Noon by the Ephemeris is 5°. 42′. 51″. N. and April 5th is 6°. 5′. 39″. N. The Difference or daily Increaſe is 22′. 48″. Say then, as 24 H. is to 5 H. 35′. ſo is 22′. 48″. to 5′. 18″. which added to 5°. 42′ 51. ″. the Sun's Declination in the Ephemeris for the preceding Noon, gives 5°. 48′. 9″. N. the Sun's true Declination at the Time required, or rejecting the Seconds, 5°. 48′. N. the Complement to 90°. (becauſe the Latitude and Declination are of the ſame Denomination) gives 84°. 12′. for the Sun's true Diſtance from the North or elevated Pole.

The Latitude of the Ship carried on by Account from the preceding Noon is 16°. 24′. N. the Complement of which to 90°. is 73°. 36′. the Co-Latitude.

| | | | |
|---|---|---|---|
| Zenith Diſt. of the Sun | 42. 36 | | |
| Polar Diſt. of the Sun | 84. 12 | Ar. Com. Sine | 0.00223 |
| Co-Latitude — — | 73. 36 | Ar. Com. Sine | 0.01804 |
| Sum — — — | 200. 24 | | |
| Half Sum — — | 100. 12 | Sine | 9.99308 |
| Half Sum — Zenith Diſt. | 57. 36 | Sine | 9.92651 |
| Sum of 4 Logarithms —— | | — | 19.93986 |
| Half Sum Coſine of — 21°. 4′½. 2 | | | 9.96993 |
| Sun's horary Angle — | 42. 9 | | |
| | H. M. S. | | |
| Therefore app. Time | 2. 48 36. | | |

Suppoſe the Watch at the Sun's Altitude ſhewed 2 H. 56′. 48″. the Difference is 8′. 12″. by which the Watch is too faſt for apparent Time. Now if the Moon's Diſtance from

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from a Star was obſerved afterwards at 8 H. 27′. 18″. by the Watch, ſubſtract 8′. 12″. and the apparent Time of Obſervation of the Diſtance is 8 H. 19′. 6″.

## To find the apparent Time from the obſerved Altitude of a known fixed Star.

The obſerved Altitude of the Star above the Horizon of the Sea muſt be leſſened by the Sum of the Dip and Refraction, the Remainder is the true Altitude of the Star, and the Complement to 90°. is the Zenith Diſtance. The Declinations of the principal fixed Stars are contained in Table p. 12 and 13, which muſt be corrected for the Increaſe or Decreaſe for any Year after 1767, according to the Variation in Ten Years ſet down in the laſt Column. The Declination ſubſtracted from or added to 90°. as the Declination of the Star and the Latitude of the Ship are of the ſame or contrary Denominations, gives the polar Diſtance of the Star.

The Zenith Diſtance and Polar Diſtance of the Star and Co-Latitude being found, the Diſtance of the Star from the Meridian is found by the very ſame Method or Proceſs of Logarithms as was before ſhewn for finding the Time by the Sun. Then ſubſtract the Diſtance of the Star Eaſt of the Meridian from its Right Aſcenſion (found by Table p. 12 and 13, corrected for any Number of Years after 1767, according to the Increaſe in Ten Years, ſet down in 5th Column) or add the Diſtance of the Star Weſt of the Meridian to the right Aſcenſion of the Star, the Difference or Sum is the right Aſcenſion of the Mid-heaven: which turn into Time by Page 6, 7, and 8. From this (borrowing 24 Hours if neceſſary) ſubſtract the Sun's right Aſcenſion in Time at the preceding Noon at Greenwich ſtanding in the Ephemeris, the Remainder is the apparent Time nearly. To which adding or ſubſtracting the Longitude of the Ship from Greenwich, turned into Time, according as it is to the Weſt or to the Eaſt of Greenwich, you will have the apparent Time nearly by the Meridian of Greenwich. Then ſay, as 24 H. is to this Time; ſo is the daily Variation of the Sun's right Aſcenſion in Time by

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by the Ephemeris, to a Number of Minutes and Seconds; which ſubſtracted from the apparent Time at the Ship, found nearly above, leaves the apparent Time correct.

## EXAMPLE.

Suppoſe the Altitude of the Star Procyon above the Horizon of the Sea, ſhould be obſerved Sept. 7th 1767 in Latitude 7°. 45′. South, Longitude 30°. 10′. Eaſt of Greenwich *per* Account, to be 28°. 16′. the Height of the Eye above the Sea being Eighteen Feet. Required the apparent Time?

| | | | |
|---|---|---|---|
| Obſerved Alt. of Procyon —— | | | 28°. 16′. |
| Sum of Dip 4′. and Refraction 2′. ſubſt, | | | 6 |
| True Alt. of Procyon — — | | | 28. 10 |
| Complement to 90°. or Zenith Diſtance | | | 61. 50 |
| Declination of Procyon by Page 12th. | | | 5. 49 N. |
| Increaſed by 90°. is — — — — | | | 95. 49 |
| the Diſtance of Procyon from the South or elevated Pole. | | | |
| The Latitude is — — — | | | 7. 45 S. |
| Therefore Co-Latitude — — — | | | 82. 15 |
| Zenth Diſtance | 61°. 50′. | | |
| Polar Diſtance — | 95. 49 | Ar. Comp. Sine | 0.00224 |
| Co-Latitude — | 82. 15 | Ar. Comp. Sine | 0.00398 |
| Sum — — | 239. 54 | | |
| ½ Sum —— | 119. 57 | Sine —— | 9.93775 |
| ½ Sum — Zen. Diſt. | 58. 7 | Sine —— | 9.92897 |
| Sum of Four Logarithms — — | | | 19.87294 |
| Half Sum, is Coſine of —— | 30. 14½ | | 9.93647 |
| | 2 | | |
| Doubled is horary Angle or Diſtance of Procyon from the Meridian to the Weſt | 60. 29 | | |
| Therefore ſubſtr. from right Aſc. of Star Page 12th | 111. 47 | | |
| Right Aſc. of Mid-heaven | 51. 18 | | |

Or

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| | H. | M. | S. |
|---|---|---|---|
| Or, in Time by Page 6th — | 3. | 25. | 12 |
| Subſtract Sun's right Aſc. in Time Sept. 7th at Noon by the Ephemeris — — | 11. | 3. | 7 |
| Apparent Time nearly | 16. | 22. | 5 |
| Long. 30°. 18′. Eaſt of Greenwich in Time, ſubſtract | 2. | 1. | 12 |
| Leaves apparent Time at Greenwich nearly — | 14. | 20. | 53 |

The Sun's right Aſcenſion in Time, Sept. 7th at Noon being 11 H. 3′. 7″. and Sept. 8th 11 H. 6′. 42″. the daily Variation is 3′. 35″. Then ſay as 24 H. is to 14 H. 21 M. ſo is 3′. 35″. to 2′. 8″. which ſubſtracted from 16 H. 22′. 5″. the apparent Time at the Ship found nearly above, leaves 16 H. 19′. 57″. the apparent Time correct.

Note, If the Longitude of the Ship Eaſt of Greenwich in Time is greater than the apparent Time at the Ship, it will be neceſſary to borrow 24 Hours, in order to find the apparent Time at Greenwich; but if the Longitude Weſt of Greenwich in Time, added to the apparent Time at the Ship, makes more than 24 Hours, 24 H. muſt be ſubſtracted from the Sum to have the apparent Time at Greenwich: And in the firſt Caſe the Sun's right Aſcenſion in Time muſt be taken out of the Ephemeris for one Day of the Month leſs than that reckoned at the Ship; and in the other Caſe it muſt be taken out for one Day more. The Sun's right Aſcenſion thus found in either of theſe Caſes, is to be ſubſtracted from the right Aſcenſion of the Mid-heaven, to find the apparent Time nearly, which muſt be corrected by the proportional Part of the Sun's daily Variation of right Aſcenſion, in like manner as has been ſhewn before.

ARTICLE

## ARTICLE III.

### To reduce the obſerved Diſtance of the Moon's Limb from a Star, or from the Sun's Limb to the true Diſtance of the Centres.

The apparent Time of the Obſervation of the Moon's Diſtance from the Sun or a Star being found by the preceding Article, add to it or ſubſtract from it the Longitude from Greenwich by Account turned into Time, according as the Ship is to the Weſt or to the Eaſt of Greenwich, and you will have the apparent Time at Greenwich nearly; with which take out of the Ephemeris, from Page 8th of the Month, the Moon's Semidiameter, horizontal Parallax, and its logiſtic Logarithm for 1767, or proportional Logarithm for ſubſequent Years; alſo the Sun's Semidiameter, from Page 3d of the Month, if the obſerved Diſtance was that of the Moon from the Sun. But the Articles, contained Page 8th of the Month, being ſet down in the Ephemeris only for Noon and Midnight, it will be neceſſary to make Proportion to find them for any intermediate Time.

Take the Difference of the Two Semidiameters of the Moon, &c. ſtanding in the Ephemeris againſt the Noon and Midnight, which immediately precede and follow the given Time reduced to the Meridian of Greenwich, and you have the Variation of the Semidiameter, &c. in 12 Hours: Then ſay, as 12 H. is to the apparent Time reduced to Greenwich, reckoned from the preceding Noon or Midnight, ſo is the Variation of the Semidiameter, &c. in 12 Hours, to the proportional Part required; which added to the Moon's Semidiameter, &c. at the preceding Noon or Midnight, if it is increaſing, or ſubſtracted from it, if it is decreaſing, gives the Moon's Semidiameter, &c. at the given Time. The Moon's Semidiameter thus found is to be augmented according to her Altitude, as follows, to obtain the apparent Semidiameter.



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| ☽ Alt. | 5°. | 10°. | 15. | 20°. | 25°. | 30°. | 35°. | 40°. | 45°. | 50°. | 55°. | 60°. | 65°. | 70°. | 75 & above |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inc. ☽ Semid. | 1″. | 3″. | 4″. | 6″. | 7″. | 8″. | 9″. | 10″. | 11″. | 12″. | 13″. | 14″. | 15″. | 15″. | 16″. |

to the logiſtic Logarithm of the Moon's horizontal Parallax, found from the Ephemeris of the Year 1767, add the conſtant Logarithm 0.4771, rejecting 1, when it ariſes in the Place of the Index, and you will have the proportional Logarithm of the horizontal Parallax, which muſt always have the Cypher 0 prefixed in the Place of the Index.

## EXAMPLE.

Suppoſe it was required to find the Moon's apparent Semidiameter, horizontal Parallax, and proportional Logarithm of the ſame, Nov. 5th 1767, at 10 H. 27 M. apparent Time in the Longitude 78°. 13′. Weſt of Greenwich. The Longitude turned into Time is 5 H. 12 M. 52 S. which added to 10 H. 27 M. (becauſe the Longitude is Weſt) gives 15 H. 40 M. (to the neareſt Minute) for the apparent Time at Greenwich, or 3 H. 40 M. after Midnight. Now the Moon's Semidiameter Nov. 5th at Midnight, by the Ephemeris, is 16′. 28″. and Nov. 6th at Noon, is 16′. 24″. therefore the Decreaſe in 12 Hours is 4″. Then ſay, as 12 H. is to 3 H. 40 M. ſo is 4″. to 1″. which ſubſtracted from 16′. 28″. becauſe (Moon's Semidiameter is decreaſing) leaves 16′. 27″. the Moon's horizontal Semidiameter at the given Time. In like manner the Moon's horizontal Parallax will be found 60′. 25″. — 5″. = 60′. 20″. and the logiſtic Logarithm of the ſame 9970 + 5 = 9975, becauſe it is increaſing. Add 0.4771, and the Sum, rejecting 1 in the Place of the Index, is 0.4746, the proportional Logarithm of the Moon's horizontal Parallax. Suppoſe the Moon's Altitude to be 52°. the Increaſe of her Semidiameter, anſwering to this Altitude ſhewn above, is 12″. which added to her horizontal Semidiameter 16. 27″. found above, gives her apparent Semidiameter 16 39″.

Now add the Moon's apparent Semidiameter, juſt found, to the obſerved Diſtance of the Moon's Limb from a Star,



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If it was the Limb neareſt the Star; but ſubſtract the Moon's apparent Semidiameter from the obſerved Diſtance, if the Limb obſerved was that furtheſt from the Star, and you will have the apparent Diſtance of the Moon's Centre from the Star. But to the obſerved Diſtance of the Sun and Moon's neareſt Limbs add the Sum of the apparent Semidiameters of the Moon and Sun, and you will have the apparent Diſtance of their Centres.

Subſtract the Quantity of the Dip of the Horizon of the Sea from the obſerved Altitude of the Star; and add 16′. leſſened by the Dip to the obſerved Altitude of the Sun or Moon's lower Limb; but ſubſtract the Sum of the Dip and 16′. from the obſerved Altitude of the Moon's upper Limb, and you will have the apparent Altitudes of the Moon and Star or Sun.

Laſtly, with theſe Altitudes, and the apparent Diſtance of the Moon's Centre from a Star, or the Sun's Centre found before, and the Moon's horizontal Parallax, or its proportional Logarithm, found in Manner ſhewn above, compute the Corrections neceſſary to be made on account of Refraction and Parallax, either by Mr. Lyons' or Mr. Dunthorne's Tables, being Part of this Work, in the Manner explained immediately after the Tables themſelves; which being applied, according to thoſe Directions, to the apparent Diſtance of the Moon's Centre from a Star, or the Sun's Centre, will give the true or reduced Diſtance of the Moon from the Star or Sun.

## ARTICLE IV. and laſt.

### To find the Longitude from the obſerved Diſtance reduced, by the Help of the Ephemeris.

Take the Difference of the next leſs and next greater Diſtances, ſtanding in the Ephemeris, then the reduced Diſtance, gives the Variation of Diſtance in Three Hours.

Take the Difference between the reduced Diſtance and the next preceding Diſtance in the Ephemeris, namely, the next

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next leſs Diſtance when it is increaſing, or next greater Diſtance if it is decreaſing; this call the Difference of Diſtance.

Subſtract the proportional Logarithm of the Variation of Diſtance in Three Hours from the proportional Logarithm of the Difference of Diſtance, gives the proportional Logarithm of the Hour with Minutes and Seconds; which added to the Hour at Greenwich of the next preceding Diſtance, gives the true Time of the Obſervation of the Moon's Diſtance from the Sun or Star by the Meridian of Greenwich; the Difference between this and the Time of the Obſervation at the Ship is the Longitude of the Ship from the Meridian of Greenwich in Time; and is Eaſt or Weſt, as the Time at the Ship is greater or leſs than that at Greenwich. This is to be turned into Degrees and Minutes of Longitude, at the Rate of One Hour to 15°. or more briefly by the Table Page 6, 7, and 8th.

## EXAMPLE.

Suppoſe the Moon's Diſtance from Regulus to the Eaſt of her obſerved and reduced Diſtance ſhould be found Jan. 13th 1767 at 10 H. 27 M. 13 S. apparent Time at Sea to be 46°. 32'. 24''. Look in the Ephemeris againſt Jan. 13th for the next greater and next leſs Diſtances than the reduced Diſtance, and you will find 47°. 20'. 18''. at 6 H. and 45°. 48'. 52''. at 9 Hours by the Meridian of Greenwich; the Difference of theſe is 1°. 31'. 26''. which is the Variation of Diſtance in Three Hours, whoſe proportional Logarithm is 2942.

Take alſo the Difference of the reduced Diſtance 46°. 32'. 24''. and 47°. 20'. 18''. the next Diſtance preceding the reduced one (namely the next greater, becauſe the Diſtance in this Caſe is decreaſing) and you will have 47'. 54''. for the Difference of Diſtance, whoſe proportional Logarithm is 5749; from which ſubſtract 2942 the proportional Logarithm of the Variation of Diſtance in Three Hours found above, and there will remain 2807, the proportional Logarithm of 1 H. 34'. 19''. This added to Six Hours, the Hour of the next preceding Diſtance in the Ephemeris, gives

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gives 7 H. 34′. 19″. apparent Time by the Meridian of Greenwich; the Difference of which and 10 H. 27′. 13″, the apparent Time at the Ship, or 2 H. 52′. 54″. is the Longitude of the Ship, reckoned from the Meridian of Greenwich in Time, which by the Table, p. 6, 7, and 8, gives the Longitude 43°. 13′. 30″. Eaſt, becauſe the Time at the Ship is greater than that at Greenwich.

N. B. The Longitude thus found is that of the Ship, when the Altitude of the Sun or Star was taken for regulating the Watch, and not when the Diſtance of the Moon from the Star was obſerved, unleſs the Altitude made uſe of for computing the Time was made at or very near the Time of the Obſervation of the Diſtance.

The Longitude is to be carried on to the following Noon, and ſo on from Day to Day, by the Ship's Reckoning in the uſual Manner, until it is again aſcertained by ſubſequent Obſervations.

END of the Inſtructions for finding the Longitude at Sea by the Help of the EPHEMERIS.

## Here follow two Examples of the Calculation of the Longitude by the Help of the Ephemeris, one from the Diſtance of the Moon from the Sun, and the other from the Diſtance of the Moon from a Star.

### EXAMPLE I.

Suppoſe the following Obſervations ſhould be taken at Sea, April 4, 1767.

| April 4, 1767. Time by the Watch. | Obſerved Diſt. of Sun and Moon's neareſt Limbs. | Obſerved Alt. of Sun's L. L. from Horizon of Sea. | Obſerved Alt. of Moon's L.L from Horizon of Sea. |
|---|---|---|---|
| h. m. s. | ° ′ ″ | ° ′ | ° ′ |
| 4. 47. 14 | 73. 41. 53 | 22. 50 | 80. 17 |
| 4. 50. 11 | 73. 43. 55 | 22. 12 | 80. 36 |
| 4. 55. 26 | 73. 47. 33 | 21. 6 | 81. 9 |
| Mean of the Time. | Mean Diſtance | Mean Alt. Sun's ower Limb. | Mean Alt. Moon's ower Limb. |
| 4. 50. 57 | 73. 44. 27 | 22. 3 | 80. 41 |

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Suppoſe alſo that at $5^h.\ 4'.\ 38''.$ by the Watch, a little after the foregoing Obſervations, the apparent Altitude of the Sun's lower Limb above the Horizon of the Sea was obſerved $19°.\ 13'$, in order for computing the Time, the Height of the Eye above the Sea being 18 Feet, the Latitude being $34°.\ 17'$ N. and the Longitude by Account $17°.\ 46'$ Weſt of Greenwich.

## Computation of the apparent Time by Article II.

The Sum of the Dip $4'$, and Refraction $3'$ or $7'$ being ſubſtracted from the obſerved Altitude of the Sun's lower Limb $19°.\ 13'$ leaves $19°.\ 6'$ to which $16'$ being added for the Sun's Semidiameter, the true Altitude of the Sun's Centre is $19°.\ 22'$, and his zenith Diſtance, $70°.\ 38'$. The Time of this Altitude by the Watch, is $5^h.\ 4'.\ 38''$. and ſuppoſe the Watch is eſtimated to be 20 Minutes too faſt for apparent Time, then 20 Minutes ſubſtracted leaves $4^h.\ 44'$. apparent Time eſtimated nearly; to which add $1^h.\ 11'$ for the Longitude by Account Weſt of Greenwich in Time, and you have $5^h.\ 55'$ for the Time at Greenwich eſtimated nearly.

Therefore the Sun's Declination by the Ephemeris is $5°.\ 48'$ N. and the polar Diſtance $84°.\ 12'$. The Latitude being $34°.\ 17'$ N. the Colatitude is $55°.\ 43'$.

| | ° ′ | |
|---|---|---|
| Zenith Diſtance of the Sun | 70. 38 | Ar. com. Sine 0, 00223 |
| Polar Diſtance of the Sun | 84. 12 | Ar. com. Sine 0, 08288 |
| Colatitude | 55. 43 | |
| Sum | 210. 33 | |
| ½ Sum | 105. 16 | Sine 9, 98440 |
| ½ Sum—Zen. Diſt. | 34. 38 | Sine 9, 75459 |
| Sum—4 Logarithms | | 19, 82410 |
| ½ Sum, Coſine of | 35. 15 | 9, 91205 |
| | 2 | |
| Sun's horary Angle | 70. 30 | |

There

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| | h | m | s |
|---|---|---|---|
| Therefore apparent Time | 4. | 42. | 0 |
| But Time by Watch was | 5. | 4. | 38 |
| Therefore Watch is too fast | | 22. | 38 |

Subſtract from $4^h. 50^m. 57^s.$ the Mean of the Times by Watch at the Obſervations of the Diſtance of the Moon from the Sun, and there remains $4^h. 28^m. 19^s.$ apparent Time.

## Reduction of the obſerved Diſtance of the Moon from the Sun according to Article III.

The Mean of the 3 obſerved Altitudes of the Sun's lower Limb above the Horizon of the Sea is 22°. 3′. to which adding 16′—4′ or 12′. for the Sun's Semidiameter leſſened by the Dip, and the apparent Altitude of the Sun's Centre is 22°. 15′.

The Mean of the 3 obſerved Altitudes of the Moon's lower Limb is 80°. 41′, to which 12′ being added, the apparent Altitude of the Moon's Centre is 80°. 53′.

The apparent Time at Greenwich eſtimated nearly being $5^h. 55'$, the Moon's Semidiameter by the Ephemeris, is 15′. 19″, the Moon's horizontal Parallax 56′. 12″, and the logiſtic Logarithm of the ſame 0283, to which add 0,4771, and the proportional Logarithm is 0,5054. To the Moon's Semidiameter 15′. 19″, adding 16″ for her Altitude 81°, the apparent Semidiameter of the Moon is 15′ 35″: The Sun's Semidiameter by Page 3d of the Month is 16′.1″; therefore the Sum of the apparent Semidiameters of the Sun and Moon is 31′ 36″; which added to 73°. 44′.27″. the mean of the 3 obſerved Diſtances of the neareſt Limbs of the Sun and Moon, gives 74°. 16′. 3″ for the apparent Diſtance of the Centres.

The principal Effect of Refraction will be found from Tab. I. of Mr. Lyons 176″, from which 32″ found by Table II. being ſubſtracted, leaves 144″=2′.24″. for the

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the Effect of Refraction, which added to 74°. 16′. 3″ gives 74°. 18′. 27″. the Diſtance cleared of Refraction. Arches the firſt and ſecond for Parallax by Mr. Lyon's Rules are 22′. 5″. and 15′. 36″; the Difference 6′. 29″. ſubſtracted from 74°. 18′. 27″. (becauſe Arch the firſt is greateſt) leaves 74°. 11′. 58″. the reduced Diſtance:

Table IV. for Parallax in this Caſe gives 0.

By Mr. Dunthorne's Tables the reduced Diſtance will be found 74°. 11′. 59″.

## Determination of the Longitude from the reduced Diſtance by Article IV.

The Diſtance of the Moon from the Sun, April 4, 1767, ſtanding in the Ephemeris next preceding the reduced Diſtance 74°. 11′. 58″ is 73°. 1′. 27″, at 3 h. and the Diſtance next following it at 6h. is 74°. 28′. 50″; therefore the Variation of Diſtance in 3 Hours is 1°. 27′. 23″, whoſe proportional Logarithm is 0,3138. The Difference of the reduced Diſtance 74°. 11′. 58″. and the next preceding Diſtance 73° 1′. 27″ is 1°. 10′. 31″, whoſe proportional Logarithms is 0,4070: The Difference of theſe two proportional Logarithms is 0,0932, the proportional Logarithm of 2h. 25′. 14″. Add 3h. ſtanding over the next preceding Diſtance, and 5h. 25′. 14″ is the apparent Time at Greenwich; but the apparent Time at the Ship was found before 4h. 28′. 19″: The Difference 0h. 56′. 55″ converted into Degrees, &c. by Table Page 6, 7, and 8, gives 14°. 13′. 45″. the Longitude from Greenwich at the Time when the Altitude of the Sun was taken from which the Time was computed, and it is Weſt becauſe the Time at the Ship is leaſt.

EXAMPLE

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## EXAMPLE II.

Sept 5. 1767. At $4^h. 59^m. 32^s.$ by Watch, let the observed Altitude of the Sun's lower Limb above the Horizon of the Sea be $10°. 29'$. The Height of the Eye above the Sea 12 Feet, the Latitude at the same Time $17°. 30'$ S. and the Longitude by Account $64°. 32'$. East of Greenwich.

| Time by Watch. | Observed Distance Moon's remotest Limb from α Pegasi | Apparent Altitude Moon's L. L. above Horizon of Sea. | Apparent Altitude of Star above Horizon of Sea. |
|---|---|---|---|
| h. m. s | ° ′ ″ | ° ′ | |
| 14. 50. 30 | 44. 53. 48 | 15. 22 | 35. 22 |
| 14. 55. 35 | 44. 50. 49 | 14. 11 | 34. 15 |
| 15. 00. 0 | 44. 48. 14 | 13. 8 | 33. 17 |
| 15. 5. 50 | 44. 44. 48 | 11. 46 | 32. 1 |
| 15. 11. 15 | 44. 41. 37 | 10. 30 | 30. 50 |
| Mean of Times | Mean of Distan. | Mean Altitude of Moon's L. L. | Mean Altitude of Star. |
| 15. 0. 38 | 44. 47. 51 | 12. 59 | 33. 9 |

The Sum of the Dip $3'$, and Refraction 5 or $8'$ subtracted from $10°. 29'$. the observed Altitude of the Sun's lower Limb, leaves $10°. 21'$, to which $16'$ being added for the Sun's Semidiameter, the true Altitude of the Sun's Centre is $10°. 37'$, and his Zenith Distance $79°. 23'$. The Time at Greenwich estimated nearly being $0^h. 41'$, the Sun's Declination by the Ephemeris is $6°. 49'$ N. and his Distance from the South or elevated Pole $96°. 49'$. The Latitude being $17°. 30'$. the Colatitude is $72°. 30'$. Hence the apparent Time will be found $5^h. 6'. 16''$. But the Time by the Watch was $4^h. 59'. 32''$. Therefore the Watch is $6'. 44''$ too slow. Add this to $15^h. 0'. 38''$, the Mean of the Times by the Watch at the Observations of the Distances, and the apparent Time of those Observations will be $15^h. 7^m. 22^s$.

To

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To 12°. 59′ the mean Altitude of the Moon's lower Limb obſerved, add 16′—3′ or 13′ for the Moon's Semidiameter leſſened by the Dip, the apparent Altitude of the Moon's Centre will be 13°. 12′. From 33°. 9′. the obſerved Altitude of the Star, ſubſtract 3′ for the Dip, and the apparent Altitude of the Star is 33°. 6′. The Longitude Eaſt of Greenwich in Time by Account $4^h. 18^m. 8^s$. (anſwering to 64°. 32′) ſubſtracted from $15^h.$ 7′. 22″, leaves $10^h. 49^m.$ the apparent Time at Greenwich eſtimated nearly. Hence the Moon's Semidiameter, by the Ephemeris, is 16′. 29″, the horizontal Parallax 60′. 32″, and its logiſtic Logarithm 9962, and conſequently the proportional Logarithm 0,4733. The Increaſe of the Moon's Semidiameter for the Altitude 13° is 4″, whence the Moon's apparent Semidiameter is 16′. 33″, which ſubſtracted from 44°. 47′. 51″, the Mean of the obſerved Diſtances of the Moon's remote Limb from α Pegaſi, leaves 44°. 31′. 18″, the apparent Diſtance of the Moon's Centre from the Star.

Hence the Effect of Refraction will be found by Mr. Lyons' Tables +1′.50″, and the apparent Diſtance cleared of Refraction 44°. 33′. 8″. Arches the firſt and ſecond for Parallax will be found 47′. 6″ and 13′. 58″, and the principal Effect of Parallax or Parallax in Diſtance 33′. 8″ to be ſubſtracted. The Number correſponding to this by Table 4th for Parallax is 9″, and that correſponding to 58′½, the Moon's Parallax in Altitude, is 30″, the Difference 21″ is the ſecond Correction of Parallax to be added; and 44°. 33′. 8″ — 33′. 8″ + 21″ = 44°. 0′. 21″ the Diſtance reduced. The ſame comes out by Mr. Dunthorne's Tables 44°. 0′. 23′. The next preceding Diſtance in the Ephemeris is 45°. 6′. 40″ at $9^h$, and the next following Diſtance at $12^h.$ is 43°. 24′. 24″; whence the Difference or Variation of Diſtance in 3 Hours is 1°. 42′. 16″. whoſe proportional Logarithm is 2455 : The Difference of the reduced Diſtance 44°. 0′. 22″, and the preceding Diſtance 45°. 6′. 40″, is 1°. 6′. 18″, whoſe proportional Logarithm is 4338 : The Difference of theſe Logarithms is 1883 the proportional Logarithm of $1^h.$ 56′. 40″.



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Add $9^h$, and the apparent Time at Greenwich is $10^h$. $56^m$. $40^s$. But the apparent Time at the Ship was $15^h$. $7^m$. $22^s$: The Difference $4^h$. $10'$. $42''$ converted into Degrees gives $62°$. $40'$. $30''$ for the Longitude from Greenwich at the Time when the Altitude of the Sun was taken for computing the Time, and it is East, because the Time at the Ship is greateſt.

N.B. An Altitude of the Sun for computing the Time might have been taken early in the Morning after the Obſervations of the Diſtance, which would have had the Advantage of the Altitude taken in the Afternoon by being nearer the Time of the Diſtance, ſo that there would be Occaſion to depend upon the going of the Watch for a leſs Interval of Time; beſides that, the Longitude would be thereby carried on for a longer Time.

FINIS.

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# ADDITION

## TO

## Mr. DUNTHORNE's Solution of the Problem for finding the Effect of Refraction and Parallax.

Communicated by Mr. DUNTHORNE.

IF we have the diſtance of the Moon from the Sun, inſtead of a ſtar (and great exactneſs be required) his parallax in altitude, taken from the following table, muſt be ſubſtracted from his refraction, and only the difference uſed in the room of the refraction of a ſtar.

### A TABLE of the SUN's Parallax in Altitude.

| Altitude of the Sun. | Paral-lax. | Altitude of the Sun. | Paral-lax. | Altitude of the Sun. | Paral-lax. |
|---|---|---|---|---|---|
| ° | // | ° | // | ° | // |
| 0 | 9 | 30 | 8 | 60 | 4 |
| 5 | 9 | 35 | 7 | 65 | 4 |
| 10 | 9 | 40 | 7 | 70 | 3 |
| 15 | 9 | 45 | 6 | 75 | 2 |
| 20 | 8 | 50 | 6 | 80 | 2 |
| 25 | 8 | 55 | 5 | 85 | 1 |
| 30 | 8 | 60 | 4 | 90 | 0 |

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# ERRATA of the TABLES requiſite to be uſed with the ASTRONOMICAL and NAUTICAL EPHEMERIS.

Page 17. Mr. Lyon's firſt Table for refraction.

| | | |
|---|---|---|
| N° anſwering to | 5° and 5° | for 0069 read 0169 |
| | 9 and 21 | for 1975 read 1795 |
| | 7 and 23 | for 2711 read 2811 |
| | 5 and 25 | for 4106 read 4206 |
| | 27 and 44 | for 0927 read 0947 |
| | 19 and 69 | for 2542 read 2592 |
| | 25 and 75 | for 1864 read 1884 |

Page 22. line 13 and 15. for 9214 read 7764
Page 23. line 4. for 30 + 15 read 50 + 25
Page 24. line 12. for prop. log. of 15′. 32″ 0.0653 read prop. log. of 15′. 29″ 1.0653

Mr. Dunthorne's Tables.

Page 58. againſt 29° under 53′ for 303,5 read 305,5
Page 63. in title (hor. par. ☽) over the laſt column, for 61′ read 62′

In the Table of proportional logarithms.

| | | |
|---|---|---|
| Log. of | 29′. 13″ | for 7996 read 7896 |
| | 29. 14 | for 7994 read 7894 |
| | 56. 28 | for 5735 read 5035 |
| | 57. 30 | for 4656 read 4956 |

Page 157. line 24 and 25. the two ar. com. ſine are each put one line too high.

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